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The Tool Engineer

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Let's Do Something About It!

EVERYBODY SEEMS TO BE screaming in a loud voice about increased production. But nobody seems to be doing very much in a constructive way about it.

We all howl about inflation and high prices. But not yet have we made any headway toward getting the four important divisions of our economy . . . INDUSTRY, AGRICULTURE, LABOR and GOVERNMENT . . . together in a concerted program to solve these problems.

Everywhere we hear wailings about the scarcity of certain goods and commodities, both industrial and consumer. But few people know the real reason for these shortages.

Everybody blames the other fellow. The wage earner calls the industrialist ugly names. The farmer swears at the wage earner. The industrialist exhausts his vocabulary on both the farmer and the wage earner. And they all end up using their choicest words on the Government.

Plain, ordinary, common horse-sense should indicate to reasonable leaders in all branches of our economy that this weeping and wailing and mud-slinging is getting us nowhere.

One of the biggest troubles seems to be that, in advancing solutions to our problems, everyone apparently is making it all the more difficult, all the more complicated. No one seems to take the common-sense approach—that of a simple understanding between the four powerful groups. In other words, those comprising these groups should pool their best efforts to reach a common goal. Their goal and that of the whole world today is PRODUCTION!

Until the industrialist, the farmer, the laborer, and the Government get together on a program that spells all-out production *by all* and *for all*, there is little if any hope that inflation with its increasing high prices, and shortages with their attendant annoyances and inconveniences, will disappear from a horizon that today presents a most unpleasant picture for us all.

The question before the four principal economic groups and the nation as a whole, is how we may increase production to avert economic chaos, not only for ourselves, but for the world. And that's a $64 question in more ways than one.

No sane-minded person will try to answer it with a simple palliative or broad platitude. But one thing is certain: A large amount of real understanding between industry, agriculture, labor and government will go a long way toward leading us out of the economic woods.

Real understanding is born of both a sense of social responsibility on the part of each group concerned and an honest spirit of "give and take." That is how this nation was started. We have learned that in times of war united action brought victory. Let's apply this type of thinking, now, in peacetime, to our economic and production problems to maintain that peace.

Unfortunately, real understanding is a commodity in which one of our greatest shortages exists. And the longer it is in short supply, the farther apart the industrialist, the farmer, the laborer and government will grow, instead of getting together to solve this problem of production.

Tool engineers are in a position to be extremely useful in bringing together the views of at least two of the most important groups involved in the achievement of increased production. Their position in relation to management and labor gives them at the same time a great opportunity and an equally great responsibility for taking full advantage of this opportunity. They are in the unique position of being able to make everyday contacts with both the men who operate the machines of production, and those who set the policies and do the planning for production.

One of the most important functions of the tool engineer is that of a "cost-cutter." In his role of middle-man between labor and management, he has the opportunity to prove to labor that the installation of improved machines will not eliminate jobs, but will work to the ultimate advantage of everyone. He can also interpret to management labor's views of the means by which it seeks to increase production. In helping labor and management to get together on the ways and means by which they both seek to attain their common goal of increased productivity, tool engineers can make a valuable contribution in the fight against scarcities and soaring prices.

Let's cut out all of this ridiculous name-calling! Let's get busy and do something about a real understanding between these four economic powers. Tool engineers, *you* have the tools and the opportunity to do a big and much needed job.

W. B. Peirce

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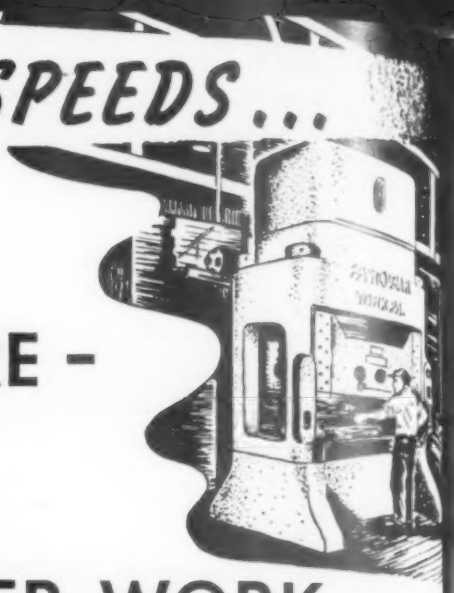

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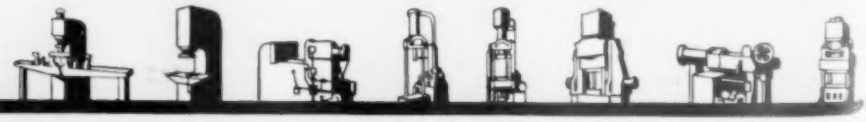

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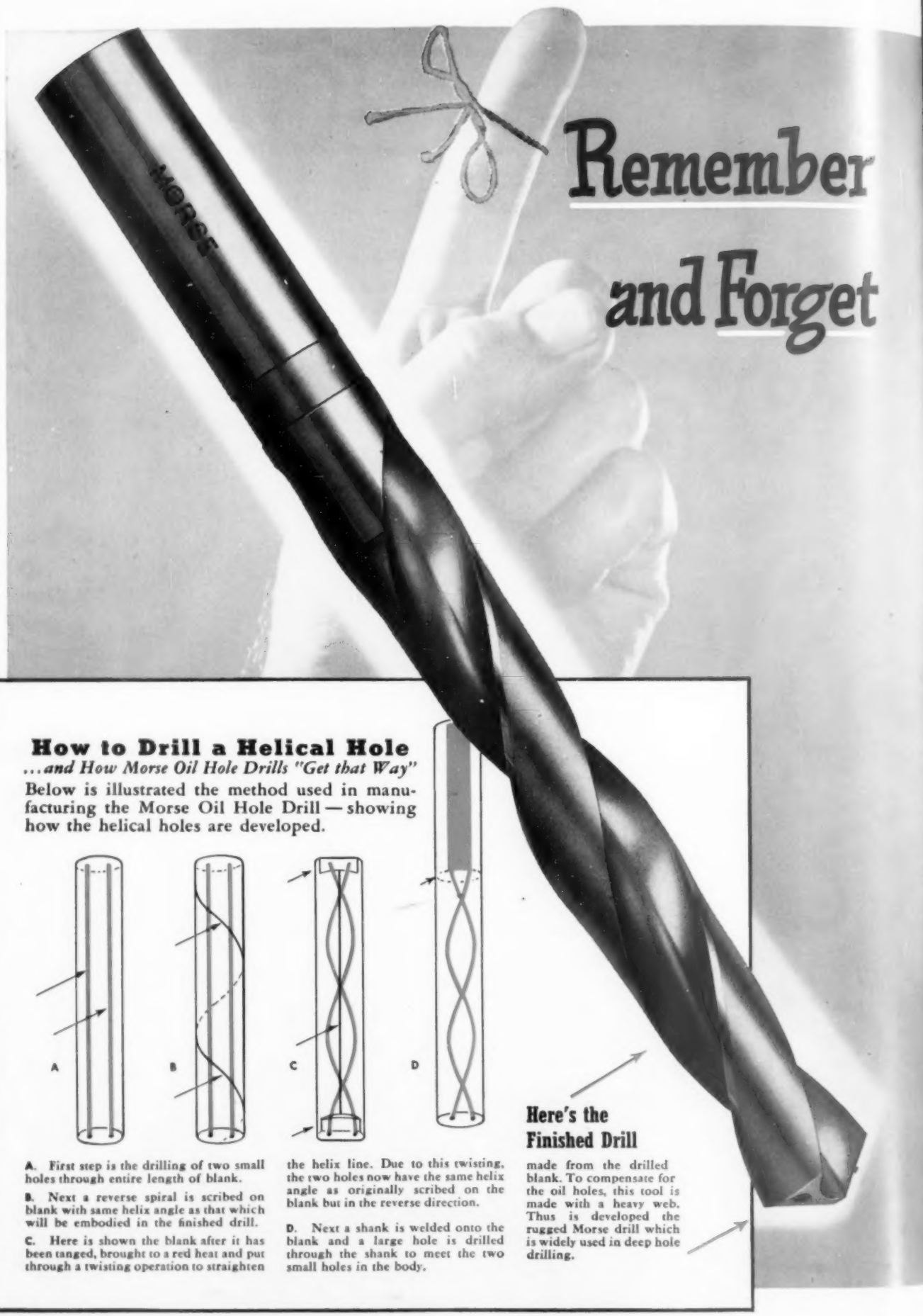

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A. First step is the drilling of two small holes through entire length of blank.

B. Next a reverse spiral is scribed on blank with same helix angle as that which will be embodied in the finished drill.

C. Here is shown the blank after it has been tanged, brought to a red heat and put through a twisting operation to straighten the helix line. Due to this twisting, the two holes now have the same helix angle as originally scribed on the blank but in the reverse direction.

D. Next a shank is welded onto the blank and a large hole is drilled through the shank to meet the two small holes in the body.

Here's the Finished Drill

made from the drilled blank. To compensate for the oil holes, this tool is made with a heavy web. Thus is developed the rugged Morse drill which is widely used in deep hole drilling.

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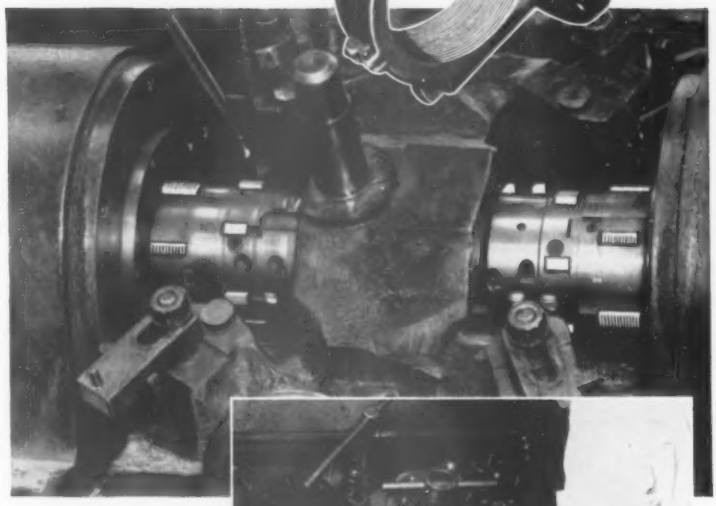

Photographs, courtesy of Eaton Manufacturing Co., Cleveland, Ohio.

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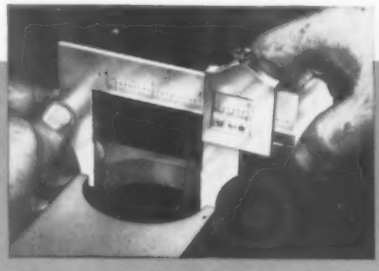

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A New Concept in the Field of Abrasives *

Resistant to wear, yet cool cutting, a new abrasive product is applicable to grinding of widely diversified materials.

by A. Albert Klein and Gordon T. Rideout

PART I—Distinguishing Features of the New Alpha Alumina Abrasive; Method of Manufacturing by Separate Crystallization of Individual Grains

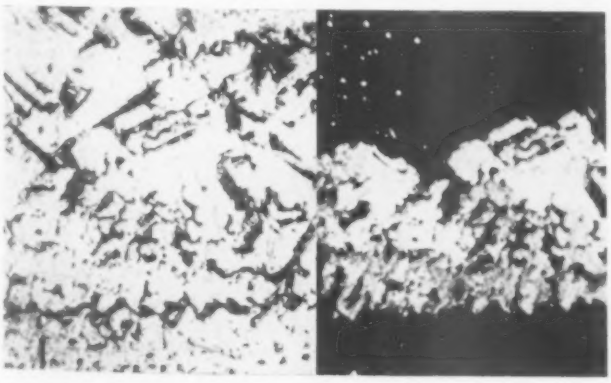
by A. Albert Klein

THE FIRST MANUFACTURED GRINDING wheels were made upwards of 60 years ago from natural emery and corundum. The original grinding wheel maker had to accept a relatively impure and variable mineral as an abrasive because nature does not produce emery and corundum in the form of pure concentrated alpha alumina crystals which are the essential working ingredients in an aluminous abrasive. These natural products often contain as little as 35% of the active, hard material comprising the cutting agent. Carefully selected commercial corundum usually carries up to 80% of alpha alumina, which is the hardest modification of alumina, but this is the best standard that is reached in a natural product.

Considering manufactured aluminous abrasives, it has been recognized for many years that abrasives of quite similar chemical composition and of like hardness can behave quite differently in any one grinding application. Furthermore, it is a fact that industrial grinding is done under the most widely differing conditions of application.

***A. Albert Klein*, who is Assistant Director of Research at Norton Company, Worcester, Mass., joined the company in 1916. Previously, he had served as Ass't Physicist, Nat'l Bureau of Standards, which he had joined immediately on graduation from University of Michigan in 1911. He has had published many papers, especially on petrography and in the fields of Portland cement, abrasives and porcelains. He is a fellow of the Am. Ass'n for Advancement of Science, the American Mineralogical Society, and the American Ceramic Society, and a member of Sigma Xi.**

FIG. 1. Thin section of brown heavy-duty abrasive in transmitted light showing coarse crystallization and included impurities; left, ordinary light; right, polarized light.



Types of Fused Alumina Abrasives

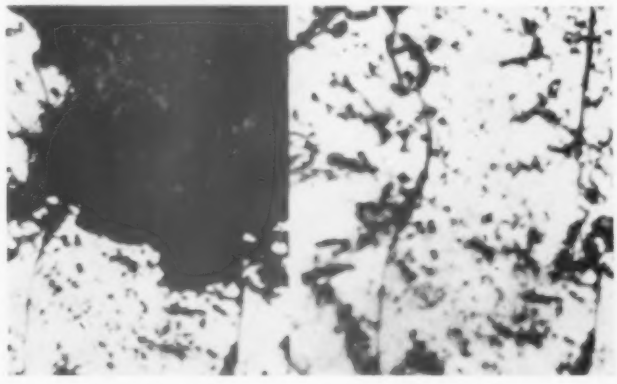
Fundamentally there are at least two properties that an abrasive grain must have—first, it must be hard enough to penetrate the work repeatedly, that is, it must dull slowly. Secondly, when the grain has become dulled to a point where excessive frictional resistance is produced, it must fracture in such a manner as to present new and sharp cutting points to the work. To meet the multiplicity of variables of application, several fused alumina abrasives of differing purity and internal structure have been developed and are in current use.

The first of these to be manufactured and applied commercially contains approximately 95% Al_2O_3, 3% TiO_2, 2% SiO_2, and 0.5% Fe_2O_3. It is produced in an electric furnace of the arc type by melting and smelting or purifying the rock known as bauxite, which contains about 80% Al_2O_3. The purification is effected by reducing the impurities with carbon according to the following general reactions: $SiO_2 + 2C = 2CO$ and $Fe_2O_3 + 3C = 2Fe + 3CO$; the Si and Fe alloy to form ferro silicon which is removed from the abrasive, first, by producing it with high enough density so that it settles to the bottom of the fused mass in the furnace, and secondly, by subsequently removing it magnetically.

This product is the toughest and strongest heavy-duty abrasive produced commercially. Visually in the lump form, it is brown in color and is dense with conchoidal fracture. The impurities are essentially a noncrystalline glass and an opaque slag which recent research involving metallographic methods using polarized light have shown to be crystalline titanium aluminates. These impurities are in the form of elongated stringers, irregular particles, and characteristically exist apart from and not joined to each other. This is shown in Fig. 1, representing a thin section of this abrasive photograph in ordinary transmitted light (left) and in polarized light (right).

* Resumé of paper, by the authors, presented at the 15th Semi-Annual meeting, A.S.T.E., held at Boston, Mass., Oct. 30, 31 and Nov. 1, 1947.

FIG. 2. Thin section of pinkish-brown abrasive of intermediate toughness.



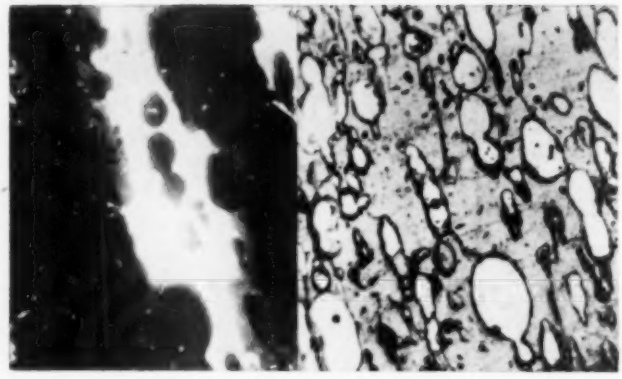


FIG. 3. Thin section of white abrasive showing micropores and inclusions of "beta" alumina.

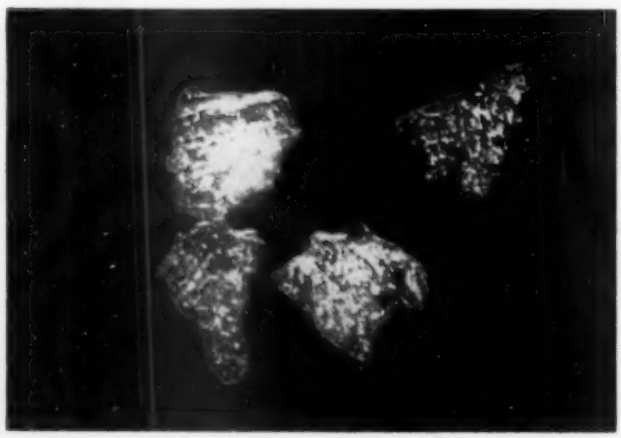
Another abrasive in current commercial use is produced in the same manner as previously described, except that the purification of the bauxite is carried along to a further degree. Its composition runs about 97% Al_2O_3, 2% TiO_2, 0.5% Fe_2O_3, and 0.5% SiO_2. This abrasive, which is of intermediate toughness, is also a dense, coarsely crystalline, pinkish brown product, and its internal structure is not too different from the one previously described. This intermediate type is shown in Fig. 2, photographed in the same manner as above.

The next outstanding step in the aluminous abrasive field was the discovery and the manufacture of a white abrasive. Here the purification is accomplished prior to fusion by a chemical processing of the same bauxite ore which was used in making the previously described products. By using the chemically purified alumina as a raw material for furnace fusion, a crystalline product is obtained in which the alumina contant runs about 99%, the chief impurity being about 0.5% Na_2O. This abrasive is rendered relatively brittle by the presence of micropores or minute cavities in the form of bubbles or elongated hollow cylinders or capillaries which persist even in quite small grain sizes. Its abrasive properties are also modified by the presence of about 5 to 7% of the so-called "beta" modification of alumina which is a relatively soft material. Fig. 3 is a microphotograph of a thin section of this abrasive, as in Fig. 1 and 2, and shows (left) minute pores and (right) the coarse crystilline alpha with inclusions of fine crystalline "beta". In Fig. 4 the tiny highlights of transmitted light indicate the presence of minutes pores in the white abrasive, commercial grain size 24.

Crushed Abrasives

Common to the making of all abrasives produced commercially up to this time is that they are cooled from fusion in the electric furnace in large masses or ingots and that these must be crushed and milled to grain form by mechanical means, namely through various types of crushers, rolls, and dry pans. The over-all final grain form will vary depending upon how the crude abrasive is milled and use is made commercially of this fact. For instance, grains of three differing external shapes are commonly produced from the milling of a single abrasive. However, for each of these abrasives and for all shapes involved, the external grain surfaces are fracture surfaces and edges. Each grain is bounded by relatively few surfaces which are essentially smooth though curved and not flat. The edges are essentially continuous though not straight. Serrated edges and granular faces are quite uncommon. Figs. 5 and 6 represent two grain shapes milled from the aforementioned brown abrasive; those shown in Fig. 5 are chunky or nearly equidimensional, whereas among those shown in Fig. 6 are some that are elongated and thin as well as some slivery grains. The grain shape obtained with the white abrasive is shown in Fig. 7.

FIG. 4. Grains of white abrasive, size 24, showing micropores.



The New Abrasive

Some years ago it was found that a manufactured abrasive comprising pure alpha alumina in the form of continuous crystals with little contaminating slag and glass impurities and without pores was a superior abrasive. The problem was to find out how to make such a product direct from bauxite in a single furnace step, and the solution of this problem resulted in the new abrasive.

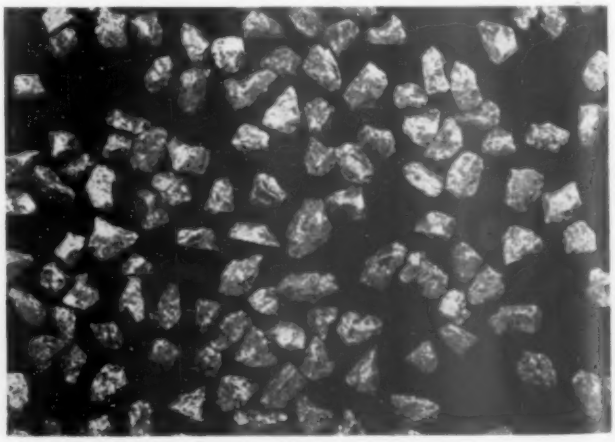
Purification and Crystallization of Discrete Grains

The process involved in its manufacture consists essentially in growing separate individual crystals of pure alpha alumina in a matrix which serves the dual purpose of absorbing or retaining all the difficult-to-remove impurities remaining in the melt at the time of crystallization and which also serves to set free these alumina crystals by a chemical leaching process. In this manner a very pure, stable, crystalline abrasive is grown, and the physical characteristics of such complete and unbroken crystals are preserved when they are separated into grain form. In this process the individual alpha alumina crystals grow in a matrix of decomposable glass which is chemically unstable and which hydrates or slakes just as burned lime hydrates with water.

Separating and Processing and Abrasive

After fusion in the electric furnace, the solidified ingot consists of these substantially pure crystalline alpha sulfide glass, primarily calcium sulfide, aluminum sulfide, and titanium sulfide. When the ingot is separated into large lumps, and the lumps are exposed to water, the sulfide matrix material immediately starts to break up into calcium

FIG. 5. Grains of brown abrasive milled to a shape that is nearly equidimensional.



sulfide which dissolves in the liquid, some hydrated alumina, and the sulfides of iron and titania, all very finely divided. This process of hydrolysis or slaking is accomplished continuously in a very large continuous slaker. It is evident that the usual mechanical breakdown of the abrasive is not necessary since the water washes away the hydrolized sludge between the grain and sets free the original alumina crystals in pure form without a crushing process. The hydrated sludge of matrix which has been converted into mud and liquid containing the dissolved alkaline sulfides is fed into a continuous train of scrubbers, washes and treaters. In this way the desired pure alpha alumina abrasive grains are separated from the impurities contained in the mud ingredients. When this is achieved, the abrasive grains are then fed to a dryer.

From this point they are magnetically separated from any small droplets of ferro silicon which may have remained included in the matrix and which did not completely settle out in the original furnace process. After magnetic separation the grains are roasted and screened to the constituent sizes. The process is fully automatic and goes on continuously from the feeding of the undecomposed lumps of alumina and matrix ingredients into the slaker down to the production of finished grain final.

Summary

To recapitulate briefly, the alpha alumina crystals are formed in the ingot surrounded by a decomposable matrix. Subsequent operations decompose and remove the matrix, thereby freeing the crystals in grain form. These are not altered by any subsequent milling operations so that the surfaces of the particles in the final sized grain are precisely those which were formed in the original fusion. In this abrasive the external grain surfaces, especially in the coarser sizes, contain many faces which are characteristically nubbly and show reentrant angles or hill and valley effects. The edges are consequently serrated and this results in very many cutting points per grain. In abrasives produced by the milling of large masses this appearance might well be taken to indicate a composite fine crystalline structure for each particle, but such is not the case here. Even for the coarsest commercial size, practically each particle comprises but a single crystal. The novel surface characteristics of the new abrasive mentioned in the foregoing are shown in Fig. 8.

The facts concerning the internal structure of the new abrasive are of considerable interest and are important to an understanding of its free-cutting properties. The alpha alumina content runs upwards of 99%, the chief impurity being titania. It contains none of the softer "beta" modification of alumina. It does not have the micropores in the form of hollow bubbles and capillaries as shown in the previously

FIG. 6. Brown abrasive milled so as to contain some elongated thin grains and some slivery grains.

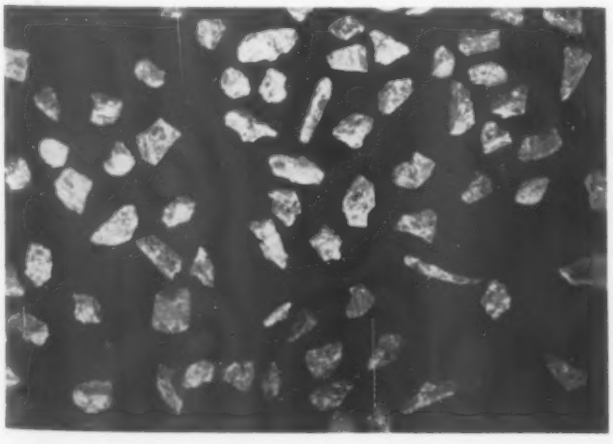


FIG. 7. Typical shape of grains of white abrasive.

described white abrasive. Instead, the impurities exist in quite a novel manner as very thin films and as tiny stringers rather uniformly spaced throughout the grain. See Fig. 9.

Conclusion

On the basis of the above facts, the following is offered as a reasonable theory for the action of this abrasive. First, it has the highest content of pure alpha alumina of all commercial alumina abrasives. Its nubbliness makes for better bonding and provides many cutting granules per grain, which in turn allows the individual grains to more deeply penetrate the work and more effectively abrade it. Furthermore, the high purity makes for a slow dulling rate of the points. When eventually the granules are dulled sufficiently however, the grain fractures along the films and stringers thus producing further sharp cutting points. The end result is a fast, cool-cutting efficient abrasive which is borne out by the consensus of field tests for most applications, especially in those involving precision and semi-precision grinding as well as in some forms of snagging.

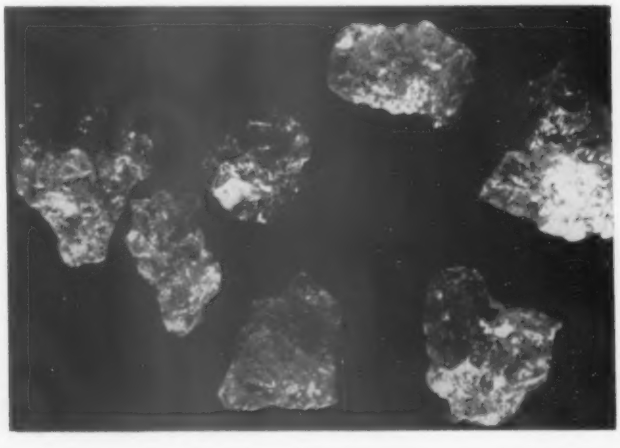
PART II—Application of the New Alpha Alumina Abrasive

by Gordon T. Rideout

APPROXIMATELY 90% OF GRINDING operations are done with fused aluminum oxide abrasives. Several special purpose aluminas are required to efficiently perform the various grinding procedures on a variety of materials.

Research and development in the metals industry has almost continuously brought forth new alloy products. The

FIG. 8. Grains of the new abrasive showing nubbly surfaces with many cutting points.



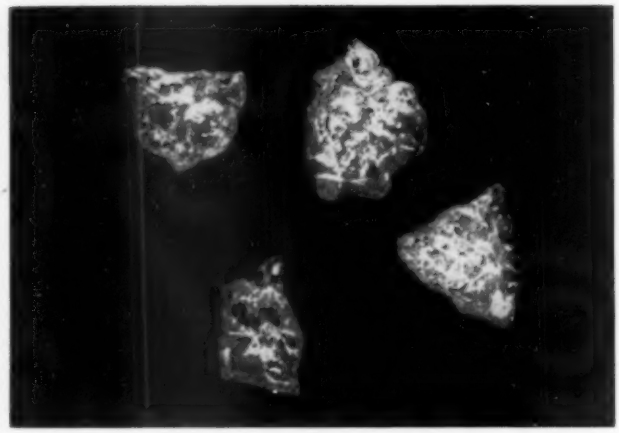


FIG. 9. Grains of the new abrasive showing film and stringer inclusions of impurities.

grinding of many of the new ones is found to be increasingly difficult. Such developments and our ever present desire to lower grinding costs suggested the need for an improved abrasive as an addition to the current types. The new alumina abrasive was developed in answer to this need and has been field tested.

***Gordon T. Rideout*, who was born in Johannesburg, South Africa, is a graduate of Northeastern and Harvard Universities. He is now Chief Field Engineer with the Norton Company, Sales Engineering Dep't, and, having directed field testing and application development of the new and unique Norton abrasives, is well qualified to discuss industry-wide application of abrasives. He is author of a number of papers on abrasives and their uses.**

As has been previously stated, industrial grinding is done under the most widely differing conditions of application. It is difficult, therefore, to summarize the results of the tests in simple tabular or graphic form. Representative case histories will be used to report the findings of the field and laboratory tests.

Nearly 2000 tests have been conducted in 24 grinding classifications. Wheels from ¼ to 60" in diameter, 16 to 100 grit size, standard grade in several resinoid and vitrified bonds were used.

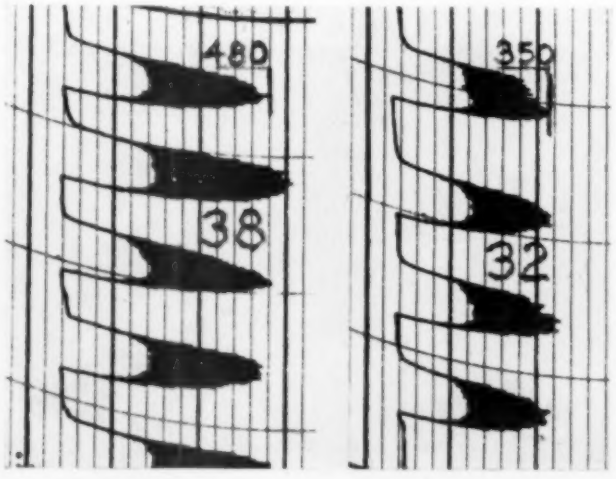
The products made of the new abrasive were compared with standard products already established in most cases as the best for the particular operation. The four major qualities of a grinding wheel were rated (1) Coolness of cut, (2) Rate of cut, (3) Ability to stay sharp, (4) Length of life.

Cooler cutting grinding wheels provide an additional margin of safety when grinding expensive tools, dies, and the like. A cool cutting wheel avoids stressing, cracking, and burning the surface of valuable alloy steel and other metal parts.

Several tests can be used to compare coolness of cutting action. One of these is based on power consumption. Over 99% of the power consumed in any grinding operation—that is, the power transmitted to the wheel—is converted to heat. Less than one percent is kinetic energy consumed in removing chips. Therefore, the less power consumed, the cooler the cutting action.

Fig. 10 shows the power consumed by two grinding wheels of the same grain size and grade, but of different aluminum oxide abrasives. The four curves marked 38 were generated by a white wheel employed in surface grinding oil hardened tool steel. The power readings show an average of 480 watts. For the same amount of wheel wear, a wheel of the new alumina abrasive required only an average of 350 watts or 73% as much power.

FIG. 10. Cool cutting action of grinding wheel is in direct relation to power consumed. The new abrasive wheel (32) is cooler cutting—350 watts compared to 480 watts for standard wheel (38).



Less Wheel Wear and Less Power

In the same series of tests an unusual occurrence was observed. Less wheel wear as well as less power was recorded for a wheel of the new alumina. It was unusual because this wheel was one grade harder than the standard comparison wheel. Ordinarily the softer the grade of the wheel the greater the wheel wear. Wheels of the new abrasive resist breakdown and yet cut cooler.

The use of the different wheels for grinding slots from the solid in a bar of hardened steel offers a visual comparison of the cool cutting qualities of the abrasives.

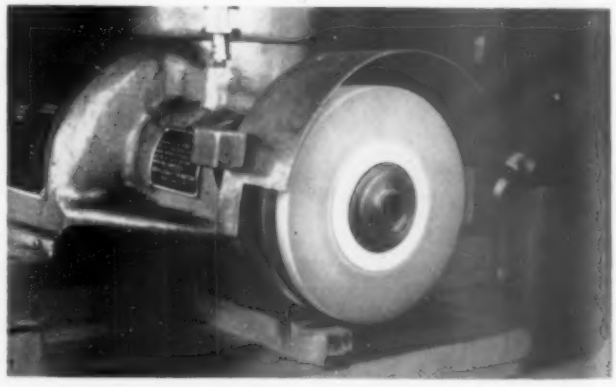
Mounting two wheels on the same spindle (Fig. 11), one of the new abrasive and the other a white wheel, provided a method of controlling the variables. In this way both wheels were dressed alike, run at the same surface speed and traverse rate. The traverse rate was very slow (48 feet per minute) in order to cause both wheels to burn the slots. The method resulted in more accurate duplication of test results as compared with running each wheel separately. Apparently it is very difficult to duplicate the face condition of a wheel each time it is dressed.

Fig. 12 shows the large burned area in the first and third slots caused by the white wheel in grinding to a depth of .250". The slots ground by the new abrasive wheel are burned only slightly at the leaving edge.

This was evidence that the new abrasive would be valuable in grinding heat sensitive alloy steels and would provide an additional margin of safety by preventing injury to expensive tools and dies by burning or creaking.

Direct comparison of the coolness of cutting action of different abrasive was obtained by taking temperature readings of the work being ground.

FIG. 11. Two-wheel set up used to obtain accurate results in test for coolness of cut.



While grinding an elliptical form in steel specimens for fatigue test (Fig. 13), it was determined that no injury to the steel was caused by grinding under conditions of speed and traverse rate which resulted in a work temperature of 45° C. Under the same conditions, use of the new abrasive resulted in a lower work temperature of 27° C., only 7° C. above room temperature. Obviously the cooler cutting action in this case could be used to an advantage, increasing the rate of cut until the temperature reached the allowable 45° C. This reduced the grinding time from 125 minutes to 25 minutes. A cooler cutting abrasive can be helpful by permitting increased rate of production without causing injury.

Rate of Cut

As previously described, a cooler cutting abrasive should have the quality of cutting faster. For many years and especially the last few years, there has been a strong demand for grinding wheels with faster cutting action. However, such a wheel must not injure the work. To obtain these results would require a superior abrasive, one which is practically pure alpha alumina and which is in the form of a single complete crystal.

Fortunately, the furnace process for the new abrasive produces crystals with a very nubbly and sharply contoured surface. The crystals are over 99% pure alpha alumina. No other abrasive combines such high purity and a nubbly surface. The sharply pointed nubs enable this abrasive to penetrate more easily even the hardest alloy steels. The small sharp points result in freer cutting and less frictional drag to generate heat. By penetrating more easily and deeply, greater depths of cut can be taken and grinding time reduced.

Approximately 40% greater production was obtained from centerless grinding wheels (32A1001-07VBE) on hardened 52100 steel rolls 7/8" in diameter removing .015" of stock in three passes (Fig. 14).

Surface grinding of large cast iron plates was accomplished in 20 minutes using a 20 x 6 x 10" wheel 32A36-G12VBEP. The best previous wheel had required 35 to 40 minutes.

In a laboratory controlled test, hardened steel rolls 1¼" x 1⅞" were plunge cut in 55% of the normal grinding time using a 32A60-18VBE wheel. Accurate test data was obtained with a cylindrical grinder equipped with a sizing device which automatically controlled the grinding cycle. Wheel breakdown was slower with a saving in dressing time.

Segments of the new abrasive were tested on a 53" double disc machine to grind both ends of hardened automotive valve springs. There was set a new goal of production which was considered very high as compared with past records. Faster cutting action was obtained with 32A30-05VBE discs and performance figures were nearly doubled. The goal was exceeded by 50%.

FIG. 12. Less burning with the new alumina in second and fourth slots.

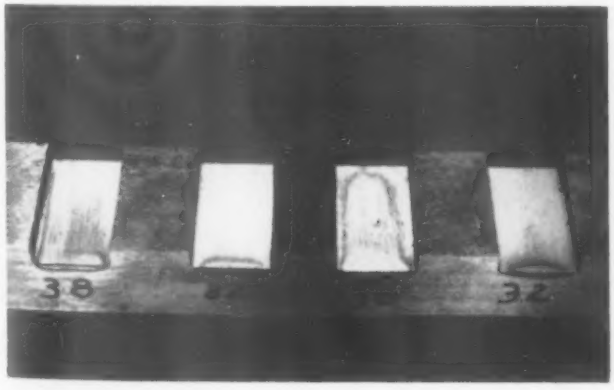


FIG. 13. Form grinding operation in which the new abrasive reduced grinding time from 125 minutes to 25.

Ability to Stay Sharp

An abrasive which stays sharp longer is a useful tool for difficult special purpose operations such as: grinding small holes especially blind holes without taper, grinding slots, grinding interrupted surfaces *flat*, and grinding unusually tough and hard die steels.

In many cases, the cost of diamonds for truing is an appreciable expense, and wheels requiring less dressing will effect a substantial saving.

Surfacing a large plate containing many wide grooves required a hard wheel to minimize breakdown. Consequent rapid dulling action necessitated dressing every .010" of stock removal at the rate of .001" per pass. A wheel of the new abrasive, grinding at the rate of .002" per pass, was dressed every .020-.030" feed. In addition, the new wheel ground the surface flat, without indenting the edges of the grooves. This indenting is commonly experienced with a dulled wheel.

On some internal grinding operations using wheels ¾" in diameter and smaller, no dressing was required for the life of the wheel. The sharper wheels ground straight holes more easily and quickly. In a case where the work was indexed in relation to the wheel and no dressing was possible, the new abrasive proved valuable.

On a heavy removal operation on large hardened steel plates, segments of the new alumina ground for 89 hours without a dressing compared to several dressings in 54 hours for the standard segments.

Wheel Life

Eight or nine dressings were necessary to grind a sleeve of 52100 steel, 9" bore, 8" width, stock removal .070-.080". The new aluminous abrasive made it possible to dress once during roughing and again before the finish pass (Fig. 15).

In the past, longer life was a quality not usually obtained with wheels whose primary purpose was faster cutting

FIG. 14. Higher production and longer life was obtained with the new abrasive on centerless grinding operations.

FIG. 15. Less dressing of the new abrasive wheels was required in internal grinding.

action. In order to obtain faster cutting action with the standard abrasives, a .softer grade wheel is used, giving consequent shorter life.

With the new abrasive, it was not unusual to receive reports of long life accompanying faster or cooler cutting action; or faster production with the same life.

In some of the field tests, abnormally short life was experienced if the grade of the wheel was too far on the soft side. It is believed this is caused by the many sharp points on the nubbly surface of the abrasive which penetrates the steel more deeply than normal and thus causes a virorous self-dressing action. This was corrected by using wheels of a harder grade which held the abrasive more securely and increased the useful life without sacrificing rate of cut.

Plunge Cutting Tough Alloy Steels

With a 32A36-N5VBE wheel plunge cutting axle shafts of 3145 and 4340 steel and removing .015-.025% stock, the wheel life was increased 33% and production was raised 15%. Fifty shafts were ground per dressing compared to 18 previously obtained.

Wheel life was increased 25% and production time was cut 25% by using the new aluminous oxide abrasive wheels on a two-wheel gear grinder. Better finish and better tooth shape was obtained.

A 32A60-J8VBE internal grinding wheel, ¾" diameter, ground hardened steel dies six times faster (.003" per pass compared to .0005") and yielded three times the life. In addition, it gave excellent finish and required no dressing.

In order to dry-grind a particular cast alloy (surface grinding a very hard and tough tungsten, chromium, cobalt cast alloy), it had been found necessary to use an expensive 100-grit diamond resinoid bonded wheel.

With a 7 x ½ x 1¼" 32A46-H8VBE wheel, a groove ½" wide and ⅛" deep was quickly ground in the material without burning of the alloy, something never done before with any abrasive wheel, except the diamond wheel. To maintain a sharp corner in the groove, a second step using a 32A80-H8VBE was used.

Rubber Roll Grinding

Grinding rubber rolls of Thiokol, Neoprene, or natural rubber is slow because the generated heat may burn the rubber or crack the grinding wheel. For this reason, light feeds using resinoid bonded wheels at high surface speeds are the general practice. In general, the feed is not over ¼" on the diameter and the traverse rate is 3" a minute or less.

Experimental grinding was done with the new alumina using a coarse grit size in a grade K wheel. Rubber being a low tensile strength material, it is usually ground with silicon carbide abrasive and not with aluminum oxide types. Because of the cooler cutting characteristic of the new alumina, it was decided to try a 24 x 2 x 12" wheel. Infeeds of .250", .500" and .700" on the diameter were possible with traverse rates up to 10" per minute.

By maintaining a slow traverse of 3" per minute, the infeed was increased to nearly an inch (.928) on the diameter—four times greater stock removal than standard practice. The finish left by this roughing cut was considered as smooth as obtained normally by finishing cuts of .005". Surprisingly, the rubber roll was comparatively cool (Fig. 17).

Grinding Various Materials

The new abrasive has successfully been used to surface grind a chuck load of parts made of different materials such as cast iron, hardened steel, soft brass, and soft steel. Loading of the wheel face did not occur from grinding soft brass and soft steel, because the hardened steel (C-62) evidently caused a self-dressing action to take place.

Several materials normally ground with silicon carbide or other abrasive have been ground with the new alumina. On occasion it has been possible to grind stainless steel, some ceramics, certain plastics, chromium plating, annealed malleable iron, rubber, cast iron, soft bronze, and, to a limited extent, carbide tools. It will not grind carbide offhand nor can it be used for coping marble or granite.

It is perhaps normal for the new alumina to grind high tensile strength materials, particularly the newly developed alloy steels of extreme toughness and abrasive resistance. However, the additional ability to grind some materials of

FIG. 16. Plunge cutting axle shafts with the new abrasive raised production 15% and increased wheel life 33%.

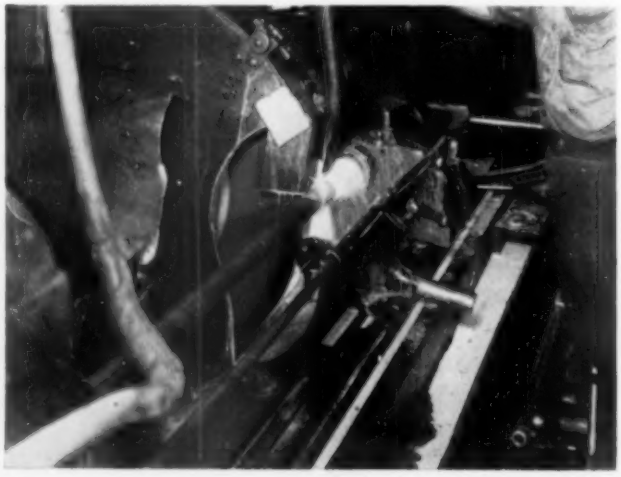


FIG. 17. The new abrasive produced unusual depths of cut in rubber rolls without overheating.

tensile strength makes it possible to grind, with one wheel, parts which are made of several unlike materials.

Surface Finish

The study is not yet complete concerning the comparative finish obtained with the new abrasive. An abrasive which cuts faster may be expected to leave a coarser finish if no attempt is made to obtain a good finish.

Until recently it was the opinion of many that the finish was slightly coarser. Many cases had been reported to the contrary and investigations were made. The following was found:

1. Freshly dressed "open" wheels left a coarser finish on the first few pieces.
2. The finish improved on the succeeding pieces and was maintained longer than with standard abrasives.
3. Comparing finishes visually was deceiving.
4. Semi-matte finishes produced by the new abrasive appeared coarser, but measurement with a Profilometer and Brush Analyzer indicated the finish was usually equal or better.
5. The depth of the scratches were more nearly alike with the new abrasive. Other abrasives sometimes left a more reflective surface but with greater variation in the depth of scratches and therefore were coarser by measurement.
6. Tests of short duration were not reliable. The variables in grinding, especially the problems involved in duplicating wheel face conditions with diamond dresser, sometimes make interpretation of results difficult.

Summary

The final finish obtained in surface grinding is likely to be greatly influenced by operator skill, condition of machine, operating technique, as well as by the abrasive. For instance, high speed steel gear shaper cutters are regularly sharpened with a 46-grit wheel made with the new abrasive. The finish obtained with this relatively coarse wheel is less than two microinches and often as low as 0.8 microinch R.M.S.

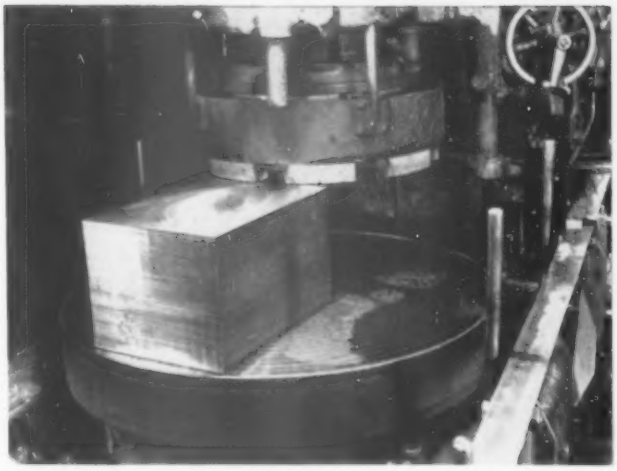


FIG. 18. Segments of the new alumina lasted twice as long and saved 1¼ hours grinding time on this block of vanadium steel.

Reviewing the manufacture of this abrasive, it will be seen that it is made in a new and novel way. It is purified in a single furnacing step which is an achievement in abrasive manufacture. The crystals of highly pure alumina are recaptured from the ingot without altering their crystalline shape. The crystals have a nubbly shape which is new and entirely different from other abrasives.

The novel shape and high purity of the alpha alumina makes possible grinding wheels which rate highly in the four qualities, (1) coolness of cut, (2) rate of cut, (3) ability to stay sharp, and (4) length of life.

Wheels of the new alumina can perform grinding operations once considered difficult or too costly. They grind the new tough and very hard alloy steels. By performing some of these difficult operations, the new abrasive will be assured a place among established abrasives, and the art of using abrasives will be benefited by this new product of research development.

Detroit College of Applied Science Enlarges Floor Space

THE DETROIT COLLEGE OF APPLIED SCIENCE, 1200 West Eight Mile Road, Ferndale 20, Michigan, has enlarged its new building to provide increased space allotted to a library, machine shop, and engineering laboratories. It is now equipped to handle an enrollment of 1,000 students.

The DCAS Production Engineering course has been lengthened to five terms of twenty-seven school weeks each, making a total of 3375 class hours. The course in Tool Engineering comprises 2700 class hours.

The College was founded in 1926 by O. B. Jones, President, who is also founder and honorary member of the American Society of Tool Engineers. Henning Freden, formerly Production Engineer for the Graham-Paige Corporation, is Dean of the College.

By A. E. Rylander

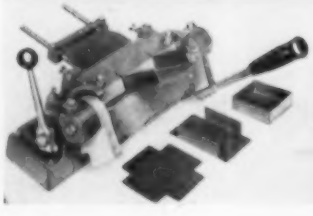
The Machine Tool Show in Review

Verbal sketches and pictorial displays of the world's greatest tool exposition.

IN SETTING OUT to write the review of the recent Machine Tool Show, there come to mind the lines between the Walrus and the Carpenter, anent the cleaning of a vast stretch of beach. " 'If seven maids with seven mops swept it for half a year, do you suppose,' the Walrus said 'that they could get it clear?' 'I doubt it,' said the Carpenter, 'and shed a bitter tear!' "

It is equally doubtful if the pooled efforts of seven writers, fully conversant with the intricacies of modern machine tools, could do justice to the Show in any one article. It was too big, too involved, for adequate verbal or pictorial portrayal in anything short of a technical encyclopedia. Practically every exhibit provided meat for one or several feature articles, and each had its story of human as well as mechanical interest.

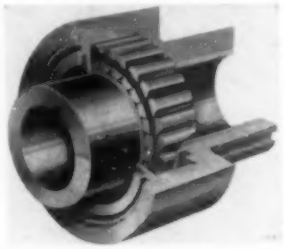
No exhibit so large, or so complete, that it could fully satisfy all who came to see, ask or listen, and none so small but that it was a center of lively interest. For here was centered the latest creations by America's composite designing and engineering genius, and each unit, in turn, was subject to the critical inspection of the world's shrewdest engineers and production executives. Here, at the Show, a meeting of minds on one objective—increased production at reduced costs.

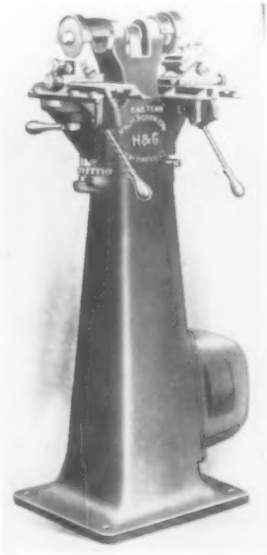


Among the diversified line of tools, by DoALL Company, Des Plaines, Ill., was the tilting table DoALL Band Saw shown at left. Below, a typical Di-acro Bench Bender, by O'Neil-Irwin Company, Lake Falls, Minnesota.

Surging multitudes flowed through aisles and corridors, or, vieing for seeing space, stood in long queues awaiting turn for a close-up of some particularly interesting display. Yet, there was an orderly confusion that, in itself, was a high tribute to the organizing genius of the Show management, executive committee and show committee. Exhibitors' personnel, in many cases wearied to near exhaustion, was buoyed to renewed enthusiasm by the eagerness of visitors come to exact the last bit of knowhow in the "making of things". Of its kind, it was one of the biggest industrial expositions in history.

In view of the marked trend toward automatic cycle tools, it was not surprising that keen interest should center on the electrical, electronics, hydraulics and pneumatics exhibits. Whether incorporated as a part of original design or used as accessories, all of these now play important roles in synchronizing and coordinating machine movements.





Above, the unique "Formsprag" Clutch, by Gear Grinding Machine Company, Detroit. At right, the H & G Chaser Grinder, by Eastern Machine Screw Corp'n, New Haven, Conn. Below, hydraulically operated and electrically controlled Precision Thread Grinder, by Ex-Cell-O Corp'n, Detroit, one of many thread grinders exhibited.

Thus, the exhibits by General Electric, Square D, Cutler-Hammer, Allen-Bradley, Clark Controller Company, Arrow Hart & Hegeman, and Furnas Electric Company became focal points for serious minded designers of automatic tools. Equal interest centered on the electric motor displays by Louis Allis, Reliance Electric & Engineering, Century Electric, Fairbanks Morse, Westinghouse, U. S. Electrical Motors and Owens-Corning Fiberglas Corp'n, the latter showing a line of Fiberglas silicone insulated motors.

"Little Giants" Among Colossi

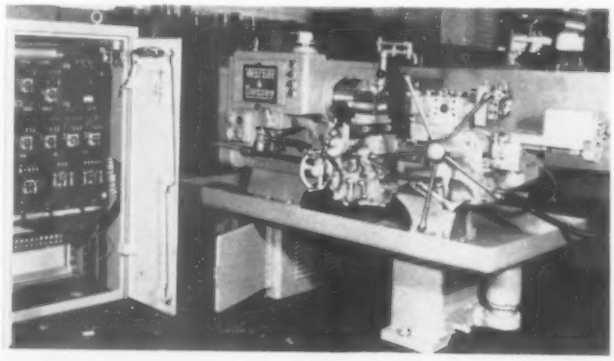
Among miscellaneous electrical appliances and tools, an electric torqueless impact nut setter—the "Speed-o-matic" by Illinois Gage Company—proved to be one of the "little giants" among a galaxy of colossi, as did the "Thor" line of electric and pneumatic impact wrenches, nut setters and screw drivers, by Independent Pneumatic Tool Company, which attracted great interest. Other displays in the electrical field included exhibits of disc brakes and clutches by Stearns Magnetic Mfg. Company and Warner Electric Brake Mfg. Company, and Noark bus ducts and accessories by Federal Electric Products.

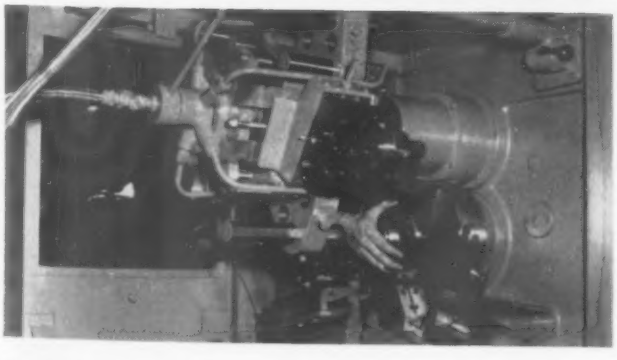
The "Lectro-Count", by the Electronic Div'n of Lansing Engineering Company, which records machine down time, rate of production, time and date per piece, also came in for its due share of attention. Reid Brothers exhibited a phase converter among other tools, and National Acme a supplementary line of counters, Chronologs, solenoids and switches. A very complete line of portable electric tools was exhibited by Precise Products Company.

Since hydraulics play an important role in the modern machine tool field, the exhibits of hydraulic units, controls and appliances by Vickers, Oilgear, Hydraulic Press Mfg. Co., Hannifin Corporation, Sundstrand, Racine Tool & Machine Company, and Logansport Machine Company were evident centers of interest. So were the exhibits by Portman, Anker-Holth, Denison Engineering Company, and Anchor Coupling Company, the latter showing high pressure hose and fittings.

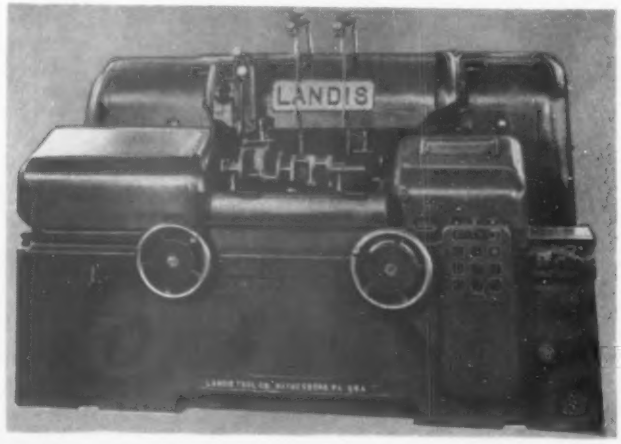
Ross Operating Valve Company's line included air as well as hydraulic valves, and attracted keen interest, as did the exhibit by C. A. Norgren Company, whose line of "air fog" lubricators promise to find wide application throughout industry. An "oil mist" lubricator was also exhibited by SKF Industries, who introduced this revolutionary

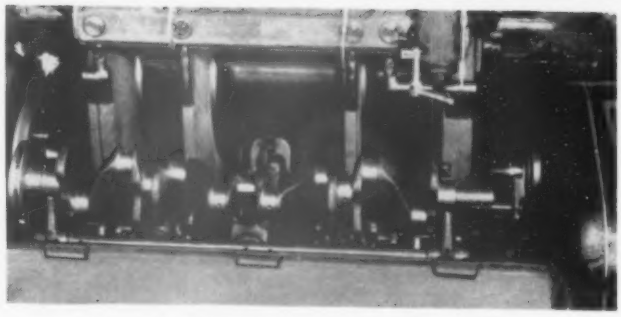
Typical of ultra-modern turret lathes on exhibit was the No. 3 Electro-Cycle Turret Lathe with electronic drive, by Warner & Swasey, Cleveland, Ohio. This machine will automatically change speed as the turret is indexed. While the W & S 1-AC (center photo) automatic chucking machine is operating, tooling for the next job can be set up on a bench-mounted dummy turret. Details of the tool holding and work holding elements is shown in detail in the lower photo.

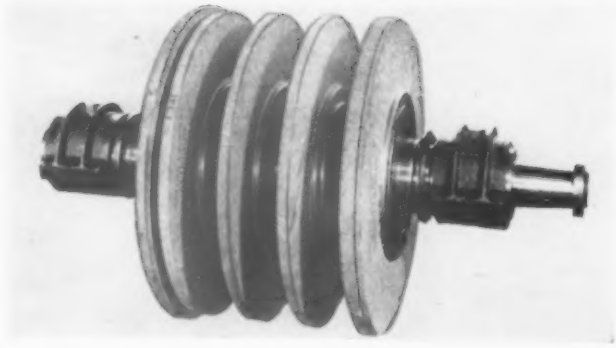




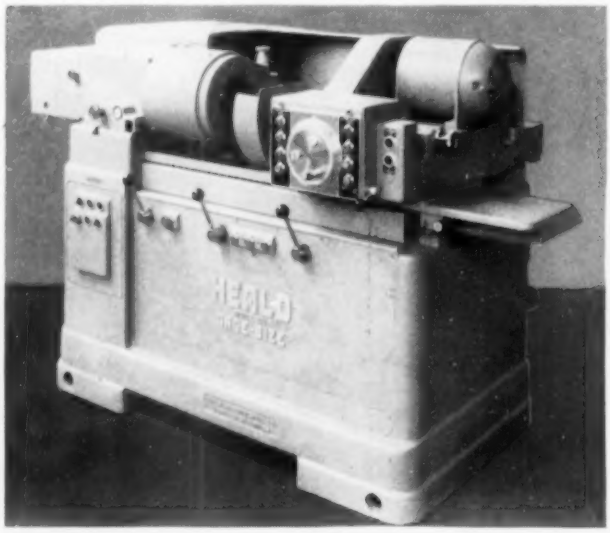
An interesting example of cost saving tools is the 16" x 40" Type H-IW Grinding Machine, by Landis Tool Company, Waynesboro, Pa. The machine is shown tooled to grind line bearings, fan fit and flange diameter of an automotive crankshaft. The five diameters of the crankshaft shown (a Ford) were ground simultaneously using 42" dia. wheels mounted on the same spindle, as shown in lower photo. Center photo shows work in cradle prior to loading.

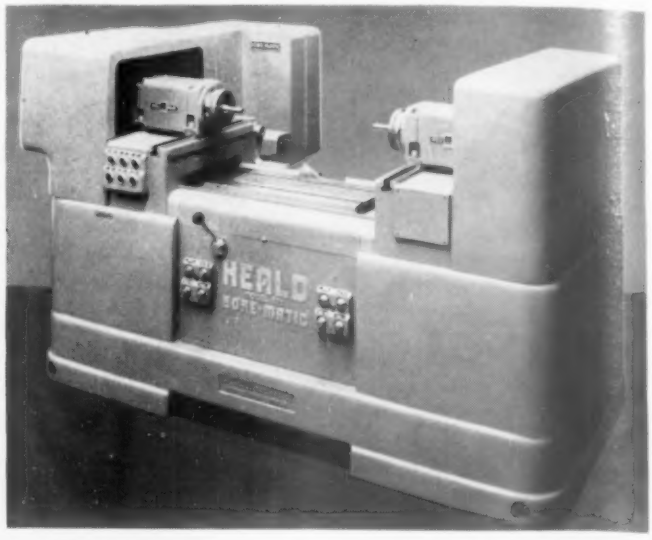


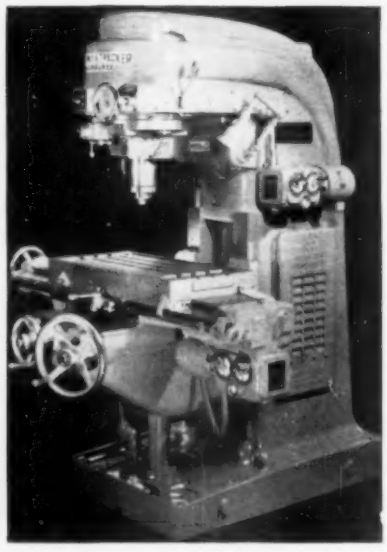


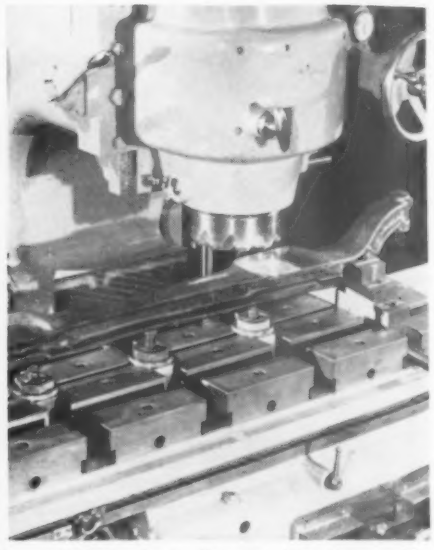


The Heald Machine Company, Worcester, Mass., exhibited precision grinding and boring machines. Shown at left is the new fully automatic Heald Chuck Type Internal Grinding Machine, Models 271-371. These machines may be had in both Gage-matic and Size-matic models. At right the new Borematic Precision Finishing Machine, Models 222-322. These versatile machines can be arranged with single or multiple spindles.









Among the highlights of the Show were machines in actual operation, such as the Milwaukee milling machines by Kearney & Trecker Corp'n, Milwaukee, Wis. Shown at left is close-up of contouring and precision die sinking on a K-T Die Miller. At center, the new Milwaukee Rotary Head milling machine, and at right, production milling on the K-T Model CSM miller.

method into the States. Further accessories, in the hydraulic line, included "metered lubrication" by Bijur Lubricating Company, filters by Purolator Products and the Cuno Engineering Company, and lubricating devices and seals by Gits Brothers.

A complete line of impeller type and Rollway positive displacement pumps was exhibited by the Pioneer Engineering & Mfg. Company. The Pioneer line, designed for high volume with comparatively low pressures, is intended for coolant and lubricant flow, and for transfer of liquids in general, rather than for high pressure hydraulic uses. Nathan Mfg. Company showed force-feed lubricating piston type pumps along with accessories.

Practically every major oil company was represented at the Show—Socony Vacuum; Standard Oil of Indiana; D. A. Stuart Oil Company; Sun Oil; F. E. Anderson Oil Company; Texas Company; E. F. Houghton & Co., and Oakite Products. From these concerns was procurable the entire gamut of cutting fluids and coolants, grinding fluids, cleaning compounds and rust preventatives, lubricants and hydraulic fluids.

For that matter, the companies listed above provided the prospective buyer with about every known hydraulic appliance and fluid now used by industry. While many of the machines on display incorporated hydraulic drives, feeds and controls, several concerns displayed self contained hydraulic units designed for inclusion with standard or special drilling and boring machines.

Thus, National Automatic Tool Company, W. F. John Barnes Co., Defiance Machine Works (which also showed performing presses for powder metals), Baker Bros., Greenlee, Barnes Drill Company—who also showed a mechanical drilling machine—and Ex-Cell-O showed hydraulic drilling and boring units along with complete machines. These, along with "packaged units" (self-contained pumps, motors and tanks) provided a wide choice of hydraulic appliances for practically every industrial purpose.

Moline Tool Company exhibited a line of hydraulic feed drilling and boring machines, while Oilgear, Lapointe and American Broach & Machine Co. (Div'n of Sundstrand) exhibited hydraulic broaching machines. Cincinnati Milling Machine Company included hydraulic broaching machines in what may be said to have been one of the largest exhibits at the Show, and Foote-Burt exhibited a vertical surface broach machine along with its line of Sipp and Hammond drilling machines and grinders. Of considerable interest was

...e of hydraulic shapers and planers by Rockford Machine Tool Company.

Hydraulic presses were shown by Hannifin, Lempco Products (hydraulic "Pressurematic"), Rogers Hydraulic, who also showed water test units), Clearing Machine Corp., (together with mechanical presses), and H-P-M, who also exhibited hydraulic die casting and plastics molding machines, as did Cleveland Automatic Machine Company. A zinc die casting machine was shown by Reed-Prentice Corp'n.

Hydraulic tube and pipe bending machines were exhibited by Pines Engineering Company and Wallace Supplies Mfg. Co., and tube bending equipment was also shown by the Parker Appliance Company, while hydraulic bar feeds, for screw machines, were shown by Hy-Level Screw Products Company. Oil-Type as well as air and dry clutches, for machine tools, were shown by Twin Disc Clutch Company, and an overrunning clutch of novel design—the Formsprag—was included in the Gear Grinding Machine Company exhibit. A lucite model self energizing clutch was shown by the V. & O. Press Company. One item, that attracted considerable attention, was a hydraulic overload pitman, for punch presses, by Dayton Rogers Mfg. Co. This concern also exhibited hydro-pneumatic and pneumatic die cushions. Somewhat out of the ordinary were hydraulic and pneumatic Hy-duty marking machines by Geo. T. Schmidt, who also showed lettering tools.

So many of the machines exhibited incorporated hydraulic drives, feeds and controls that the visitor had opportunity to see these in every possible form of application. Together with electrical and electronic controls, the Show as a whole constituted a ten day course in modern machine design and engineering to all practical purposes. It was productive of ideas, whether for specific or general application.

Displays ranged from tiny jewels, exhibited by the Sapphire Products Div'n of Elgin National Watch Company to such colossi as the "Hydro" Hydraulic openside planers and the "Hypro" line of turning and boring mills, and planer type milling machines, by the Cincinnati Planer Company; the heavy-duty openside planers by the Cleveland Planer and Liberty Planers, that curled off huge chips with "the greatest of ease", Keller machines by Pratt & Whitney, and a huge press brake by Cincinnati Shaper Company.

Also, among the colossi, can be included what is said to be the world's largest milling cutter, by Ingersoll Milling Machine Company—a "gadget" of almost unbelievable proportions. Among the "world's largest" was also Armstrong Blum's huge hacksaw machine, illustrated in September *The Tool Engineer*. The latest in sawing machines was also shown by Peerless Machine Company.

All Exhibits Interesting

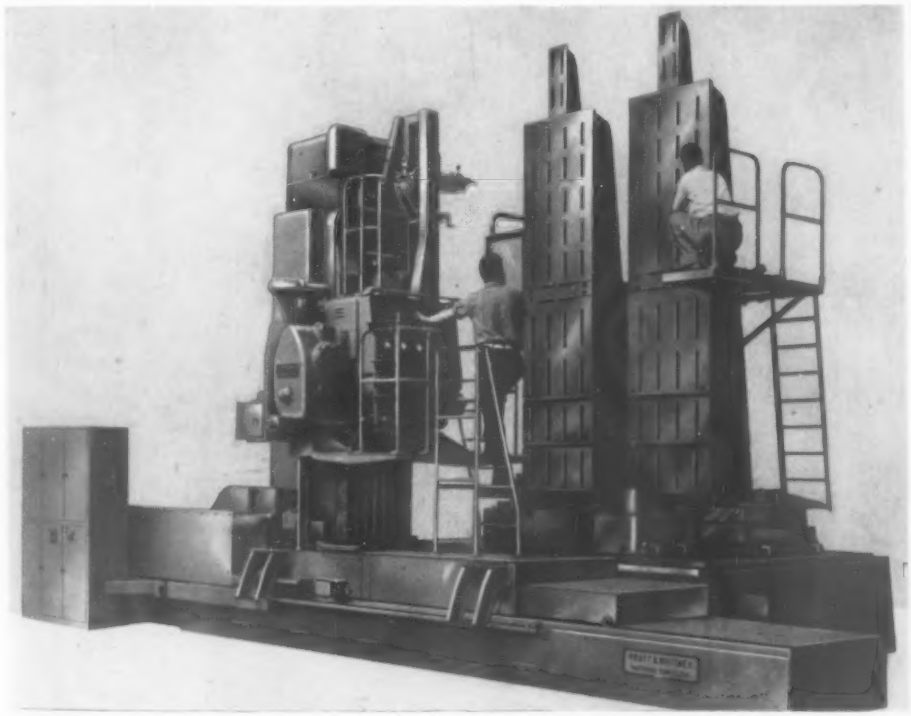
It would, of course, be entirely natural to assume that machines in operation would attract a major share of attention, and that these displays would "steal the show" from what may be termed the static exhibits—i.e., small tools, gages, cutting tools and so on. This was not so, although it must be admitted that there is a certain fascination—especially for the executive alive to enhanced production possibilities—in watching heavy-duty machines remove stock at a rate previously only considered possible in woodworking tools. As, for example, the comparatively small planer by the G. A. Gray Company that plowed through heavy interrupted cuts without perceptible tremor.

The displays of carbide cutting tools by Kennametal (who introduced a new round nose tool bit with unusually wide application along with conventional standard types), by Carboloy Company, who exhibited cemented carbide sheet metal dies and carbide wear resistant parts together with standard cutting tools and blanks, and by Vascoloy Ramet, who exhibited Tantung drills and keyway cutters along with a demonstration of carbide shell and milling, in nowise suffered from lack of interest during the ten days of the Show.

As for that, practically every exhibitor of cutting tools included carbides and cast alloys—Armoloy, Stellite, Rexalloy among others—in a wide variety of cutting tools. For example, Lovejoy Tool Company, Goddard and Goddard, Gay-Lee Company (carbide slitting saws), O.K. Tool Company, and Weddell Tools (who included flywheel arbors among face mills and boring heads) all enjoyed unusual attention. This also held true for Pratt & Whitney's unusually complete line of cutting tools, and for the display of Midget mills and chatterless countersinks by Severance Tool Industries. Staples Tool Company exhibited a novel expansion reamer together with circular carbide tipped tools.

Other concerns — Continental Tool Works (Div'n of Ex-Cello-O), Eclipse Counterbore Company, Everede Tool Company, Super Tool Company, Apex Tool & Cutter Co., and C. C. Craley—exhibited tool holders, boring bars and adapters together with standard and special lines of counterbores, spotfacers and other cutting tools.

Armstrong Brothers and R & D Toolholder Company each exhibited diversified lines of lathe and planer tool holders among other items. Also of considerable



Among outstanding tools exhibited was this huge Type BG-22 Keller Machine, by Pratt & Whitney, Div'n Niles-Bement-Pond Company, Hartford, Ct. Powerful and accurate, the machine is controlled by a sensitive tracer and operated by simple electrical circuits, and automatically reproduces in metal the shapes and contours of a master form or model. This machine was sold, during the Show, to the Budd Company, Philadelphia.

interest were the "Hardsteel" drills, by Black Drill Company, which easily drilled holes through file-hard steel, and the exhibit of hyper drilling by Republic Drill & Tool Company. All of these concerns, including Burg Tool Company —who exhibited "Toolflex" neoprene holders among other accessories—reported "good business."

From the widely diversified lines of tools shown, one could have selected the complete equipment for practically any line of manufacture. Any die shop, for example, could have been completely equipped with Kellering, die sinking, duplicating and profiling machines from the comprehensive exhibits by Pratt & Whitney, George Gorton, Kearney & Trecker, Cincinnati Milling and Reed-Prentice, all these in addition to die making machines by Oliver Instrument Company and Henry & Wright. And apparently, the show was a Mecca for the diemakers.

And, the tools mentioned above included, any tool room could have been equipped, to the ultimate of "the heart's desire", with precision lathes by Monarch Machine Tool Co., Hardinge Brothers, Rivett Lathe & Grinder, the Hendey Machine Company, Springfield Machine Tool Company, Reed-Prentice, American Tool Works, R. K. Leblond, Lodge & Shipley, Pratt & Whitney, and Sidney Machine Tool Company. Most of these concerns manufacture heavy duty precision lathes or general purpose manufacturing lathes and—in some cases—special lathes in addition to tool room equipment.

Special purpose and production lathes were also shown by Axelson, Boye & Emmes, Cincinnati Lathe & Tool Co., Lehman Machine Company, King Machine Tool Co., and Lipe-Rollway, who also exhibited a car wheel boring machine. Master Mfg. Company showed a lathe converter for milling, grinding, boring, drilling and internal keyseating, also precision indexing attachments.

Tool room and production millers were shown by Cincinnati Milling Machine Company, Kearney & Trecker, W. B. Knight, Hardinge Brothers, Kent-Owens and Van Norman Company; jig borers by Cleereman, Fosdick, Pratt & Whitney (also jig grinders) and Devlieg. Precision boring mills for all tool room and manufacturing requirements were shown by Giddings & Lewis, Bullard, Ex-Cell-O, Heald, Baker Brothers, King Machine Tool Co., W. B. Knight, Lucas, and the Universal Boring Machine Company.

Should it strike the reader that this writing entails a considerable repetition of manufacturers and their products, it is suggested that *The Tool Engineer* proposes the fullest possible coverage of the Show consistent with space limitations. This "review" is written primarily for the benefit of the thousands of tool engineers and other industrial executives who were unable to attend, and also as a reminder for the scores of thousands who were "among those present."

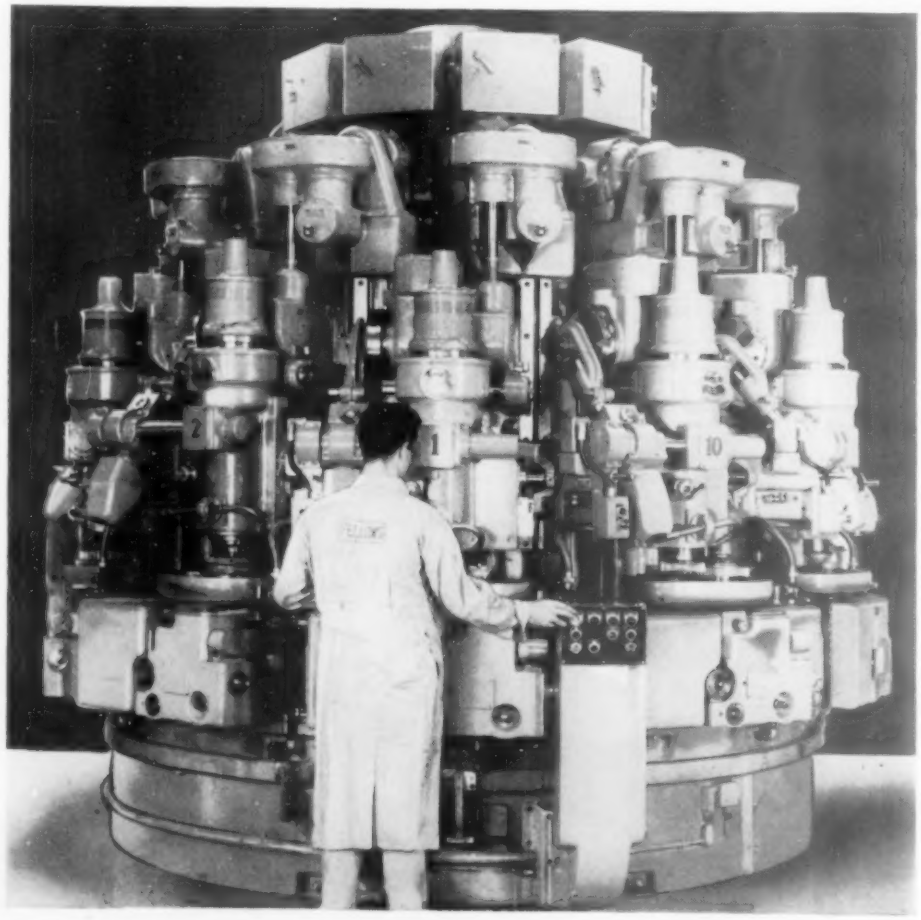
This article may therefore be considered a fairly comprehensive sketch of the Show as a whole—at least, it conveys the impressions of this reporter—and while names and products are but loosely cross indexed, to use that term, they nevertheless serve to reconcile the product with the source of manufacture. *The Tool Engineer* staff will gladly serve as an intermediary for those desiring further information on the products mentioned.

Standard and Special Equipment

Radial drills, both for tool room use and for general manufacture, were exhibited by Cincinnati Bickford Machine Tool Company, whose "Super-service" drill also incorporated the Man-au-trol spacer table; Fosdick Machine Tool Company, Cincinnati Gilbert Machine Tool Company, American Tool Works and the Carlton Machine Tool Company. The majority of these concerns also exhibited heavy duty single spindle drilling machines, as did Baker Brothers, the latter showing both electronic feed and hydraulic feed drilling machines in addition to a crank action keyseater and a vertical spindle contour grinder.

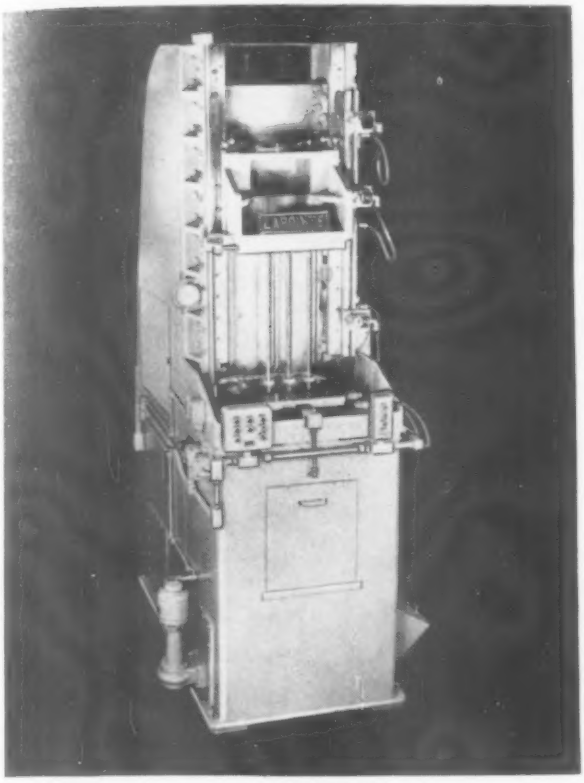
At about every turn, one ran into standard and special production drilling machines, as well as single and multiple purpose machines. As, for example, automatic drilling machines for high production by Kingsbury, Rhenberg-Jacobson, and a 12-spindle continuous drilling machine by Davis & Thompson. Multi-drills were shown by Bausch, Leland-Gifford, Commander and Langelier; automatic drilling machines and power screw drivers by Bodine Corp'n.

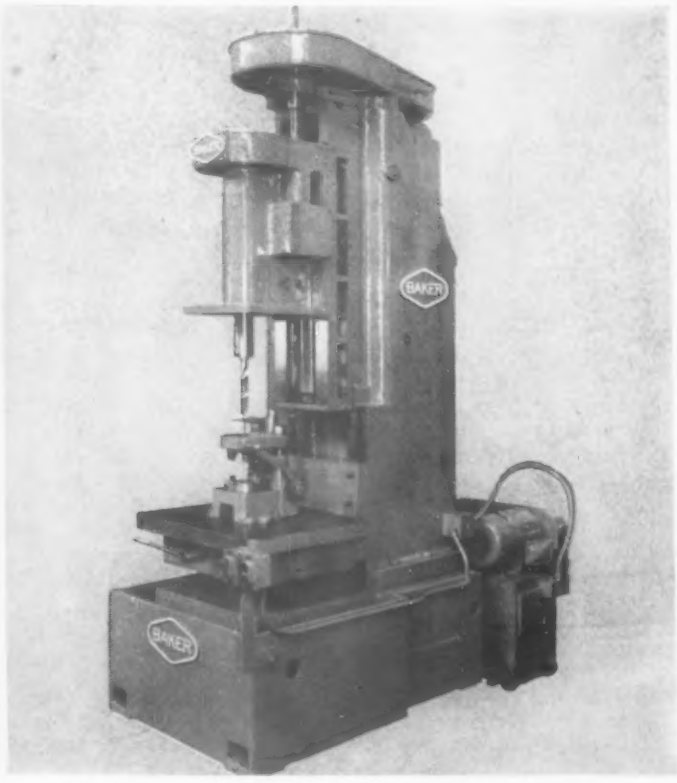
Automatics were shown by Avey; a variable speed drilling machine by Taylor-Fenn; and a "Quadrill" 4-position

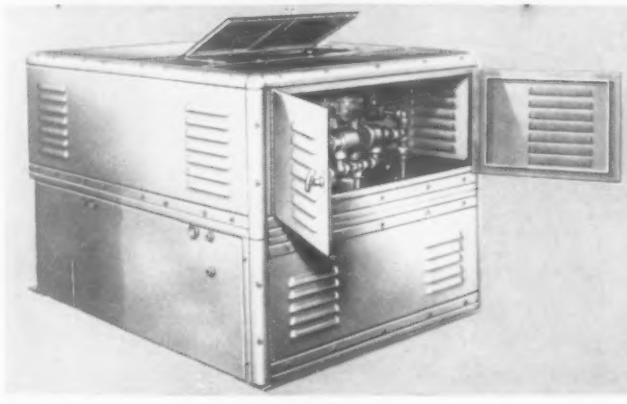


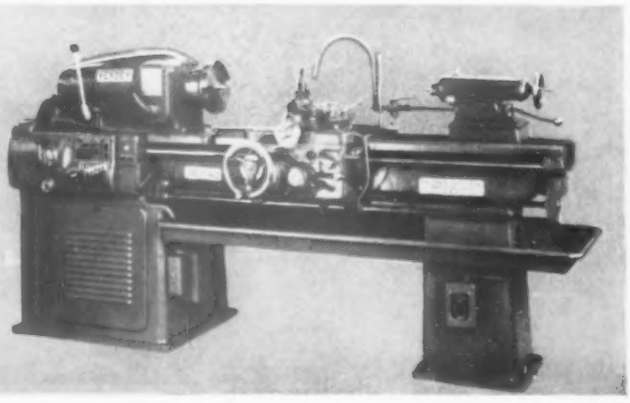
Among the many advanced tools exhibited was this fully automatic, high production Rotary Gear Shaper, by the Fellows Gear Shaper Company, Springfield, Vt. A single "big machine" which concentrates and coordinates the flow of material, the tool will cut spur, helical and cluster gears at rates over 400 per hour, depending on material and nature of work.

At left, below, the Model V-3 Vertical Hydraulic Pull-down Broaching Machine, by the Lapointe Machine Tool Company, Hudson, Mass. This machine, which is shown tooled to broach three different sizes of automobile clutch hubs at a time, was but one of several broaching machines shown by Lapointe. At right, the Model 17H0 Vertical Hydraulic Thread Drill, by Baker Brothers, Inc., Toledo, Ohio. The machine has ample power to drive a 2" high speed steel twist drill through mild steel.









Among many exhibits of hydraulic units and appliances was this custom built hydraulic power unit, built to specific requirements, by Vickers, Inc., Detroit. Completely protected by a sheet metal cabinet, the complete hydraulic system, including pumping units, oil tank, valves, pipes, filters and other accessories all combined as a "Package Unit."

Unveiled at the Show was this No. 2 Belt-driven Lathe, by the Hendey Machine Company, Torrington, Ct. Designed for general purpose work, this tool incorporates remote-controlled belt shifting arrangement, spindle speed range 30-1142 rpm, push button start and stop, with warning pilot light, automatic lubrication and arrangement for multi-start thread cutting.

drilling and tapping turret head by Chicago Drillet Corp'n. The latter concern also exhibited an instant speed changer for drill presses, and a standard drill jig. Kaukauna Machine Corp'n showed horizontal and universal drilling and tapping machines, together with a very versatile indexing table, and Buhr Machine Tool Company fixed center multi-spindle drilling and tapping heads together with a hopper feed double end machine.

Grinders, for about every conceivable tool room use, and for general manufacturing, were on display. Each was as modern as the Show itself, and while each exhibitor proudly extolled the virtues of his own product, the ambling observer could only marvel at the performance possibilities of all. In application, they ranged from a planer type, wide-belt sheet grinding machine, by Mattison Machine Works, for grinding and polishing sheet metal up to 36" wide at one pass, to the highly diversified line—including automatic contour grinders and lapping machines—by Norton Company.

Snagging and production grinders were exhibited by Smith & Mills; production grinders by Hanchett Mfg. Co., Chas. H. Besley & Co., Gardner, Blanchard and Arter Grinding Machine Co.; jig grinders by Pratt & Whitney and the Springfield Machine Tool Company. Thread grinders were shown by Ex-Cell-O, Jones & Lamson and Landis Machine Company, the latter's machine a centerless. Landis Tool Company also included a centerless thread grinder in a very complete line of grinders. Thread & form—and contour—grinders were shown by Sheffield Corporation, centerless lapping machines by Size Control Company and Cincinnati Milling, and general purpose and special superfinishing equipment by Gisholt Machine Company.

Bryant Chucking grinders had table movements so frictionless that a child could move them with the touch of a

finger, and included a machine to grind O.D., I. D. and face at one setting. Chaser grinders were shown by Eastern Machine Screw Corporation and Landis Machine Company, and Swiss type universal cutter grinders by George Gorton. Tru-forming was demonstrated by the Thompson Grinder Company who, with the Sheffield Corporation, pioneered crush forming of grinding wheels in the United States. Crush dressing was also included, along with tap grinders, in the Gallmeyer & Livingston exhibit.

Bridgeport Safety Emery Wheel Company's extensive line included an electronic sizing device, and automatic sizing was also a feature of the Gage-matic and Size-matic grinders in the Heald line. Surface grinders were shown by Reid Brothers; Abrasive Machine Tool Company—who also displayed a graduating machine along with tool and cutter grinders; Covel Manufacturing Company (hydraulic and hand, and cutter and drill grinders); and Taft-Peirce Manufacturing Company, whose line also included magnetic chucks and precision gages and tool room accessories.

The extensive exhibit by Brown & Sharpe Manufacturing Company included plain and surface grinding machines, universal grinders and universal tool and cutter grinders as well as grinding attachments, and Royal Oak Tool and Machine Company exhibited grinding machine universal fixtures for radial and relief grinding as well as for cutter sharpening.

The Fitchburg Grinding Machine Corporation's line included a drum type automatic (continuous) grinding machine that attracted considerable attention, while Matco Tool Company showed a radii and angle dresser, and grinder vises, along with other accessories. One exhibit that attracted more than ordinary interest was the display of honing machines by Micromatic Hone Corporation.

Equal interest was shown in the tiny burnishing tools by Sapphire Products Division—in fact, the tools mentioned, including precision grinders by Rivett, embraced the Alpha and Omega of surface finishing equipment.

Grinding wheels and abrasive products for all possible requirements were on display by the Carborundum Company, Chicago Wheel & Mfg. Company, Bridgeport Safety Emery Wheel Company, and Macklin Company. Besley, Gardner and Blanchard exhibited wheels suited to their particular machines.

Automatic Crankshaft Machines

Evident centers of interest were the automatic crankshaft lathes by the R. K. LeBlond Machine Tool Company, a turn milling machine, for automotive crankshaft cheeks, by Gisholt Machine Company, and automatic crankshaft balancing machines by the latter concern. Bear Manufacturing Company also exhibited industrial static and dynamic balancing machines that attracted close attention, while pillow block type balancers, by Anderson Brothers, had a constantly renewing ring of interested spectators.

Since one cannot operate machine tools without holding devices, it goes without saying that these accessories came in for their share of attention. These ranged from comparatively simple yet ultra-modern drill chucks, by Jacobs, to power operated chucks by Logansport Machine, Union Manufacturing Company, Skinner Chuck Company and Cushman Chuck Company, who also exhibited a power operated chuck wrench. Barker wrenchless chucks, and Barker drill press vises, were shown by Thomas Hoist Company.

Wahlstrom Tool Div'n of American Machine and Foundry Company exhibited fully automatic chucks and tapping attachments; the Chas. L. Jarvis Company a line of q.c. chucks and collets together with the Torquematic tapping attachments and tungsten carbide rotary files, while Hardinge Brothers exhibited collet chucks, collet index fixtures and the Hardinge standard line of collets. Rivett Lathe & Grinder also exhibited draw-in collets and step chucks together with lock jaw all-purpose work clamps, and Wilton Tool Mfg. Co. exhibited a bench vise of unusually rugged construction.

Various tools were on exhibit for the machining of threads, both external and internal. Notable, in this category, were the planetary millers for thread and circular form milling by the Plan-O-Mill Corporation and the Hall Planetary Company, and thread rolling machines by Landis Machine Company. The latter also exhibited an automatic threading and forming machine as well as the Landmaco leadscrew threading machine and Lanco and Landex heads for turret lathes and automatic screw machines.

Hanson-Whitney Machine Company exhibited a semi-automatic universal thread miller, among other items, while a production thread miller was shown by Lees-Bradner. Self opening die heads were available from Landis Machine, Eastern Machine Screw Corp'n, Jones & Lamson, Geometric Tool Company, and Jarvis, while a wide range of taps, dies and threading accessories were on exhibit by Threadwell Tap & Die Div'n, the Sheffield Corp'n.

While an attempt has been made to group tools according to class, for reader convenience, a broad overlapping is inevitable due to the diversity of products by many of the exhibitors, notably Pratt & Whitney, Brown & Sharpe and Hardinge Brothers. The latter's extensive exhibit took in precision millers, lathes, second operation machines—ran the gamut from machine tools through to holding devices and cutting tools. The same can be said for Brown & Sharpe's, whose automatic screw machines seemed to be the center of attraction although all of the B & S displays were ringed by the interested.

For that matter, all of the exhibits of screw machines and turret lathes seemed to hold a marked fascination for the majority of spectators. Thus, the exhibits by Potter & Johnston, Jones & Lamson, Gisholt, National Acme and New Britain Machine Company were jammed to capacity, as were the displays by Cone Automatic, Warner and Swasey and Cleveland Automatic Machine Company. A high speed 5-spindle automatic screw machine by Davenport Machine Tool Company also had its ring of the interested. In a related field, a line of turret tool posts, by Enco Mfg. Co., was a center of lively interest.

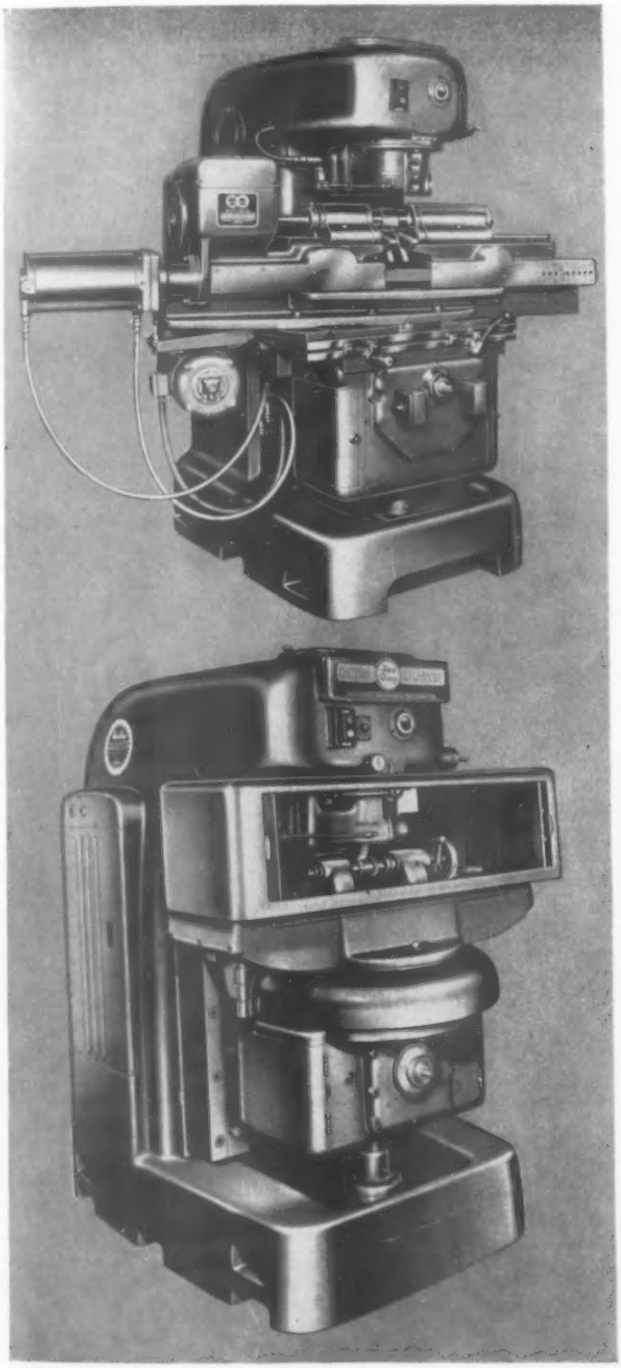
Great interest centered on the exhibit by the Bullard Company, with its Man-au-trol, on the rather unusual design of the vertical chucking machine by King Machine Tool Co., and on the several standard and novel chucking machines by Goss & Deleeuw. The exhibits by Greenlee Bros. & Co., Bardons & Oliver, Oster Mfg. Co. and Seneca Falls Machine Company were equally interesting. One had to wedge in for a look-see.

The Latest in Gear Tools

The gear manufacturer had a choice of tools ranging from gashing of gear teeth to precision grinding and shaving, and all operations in between. Hobbing machines by Gould & Eberhardt, Barber-Colman, Cleveland Hobbing Mach. Co. and Lees-Bradner; spur and helical gear shaping by Fellows Gear Shaper Co.; bevel gear generating by Gleason Works; gear shaving by Michigan Tool Company, National Broach & Machine and Fellows; gear tooth rounding by Gay-Lee; gear grinding by Gear Grinding Machine Company, Pratt & Whitney and Vinco (from the solid); burring by Sheffield; and inspection and checking by concerns named above as well as Illinois Tool Works (who also showed a fine gear generator), George Scherr Company and Orlandi Gear & Mach. Co.

Tools for control of quality ranged from machinist's scales, micrometers and verniers—as by Lufkin Rule Co., L. S. Starrett Company and Brown & Sharpe—to precision gage blocks; from hardened steel and Norbide and Sapphire faced plug gages to electric, electronic and high amplification air gages by Pratt & Whitney, Sheffield Corporation, Federal Products Corp'n, Merz Engineering Company and Brown & Sharpe. Engineers Specialties Div'n showed an advanced line of optical comparators; Wilson Mechanical Instrument Company Rockwell hardness testers and Tukon testers for microhardness of very thin materials; and Physicists Research Company "profilometers" and ball race testers.

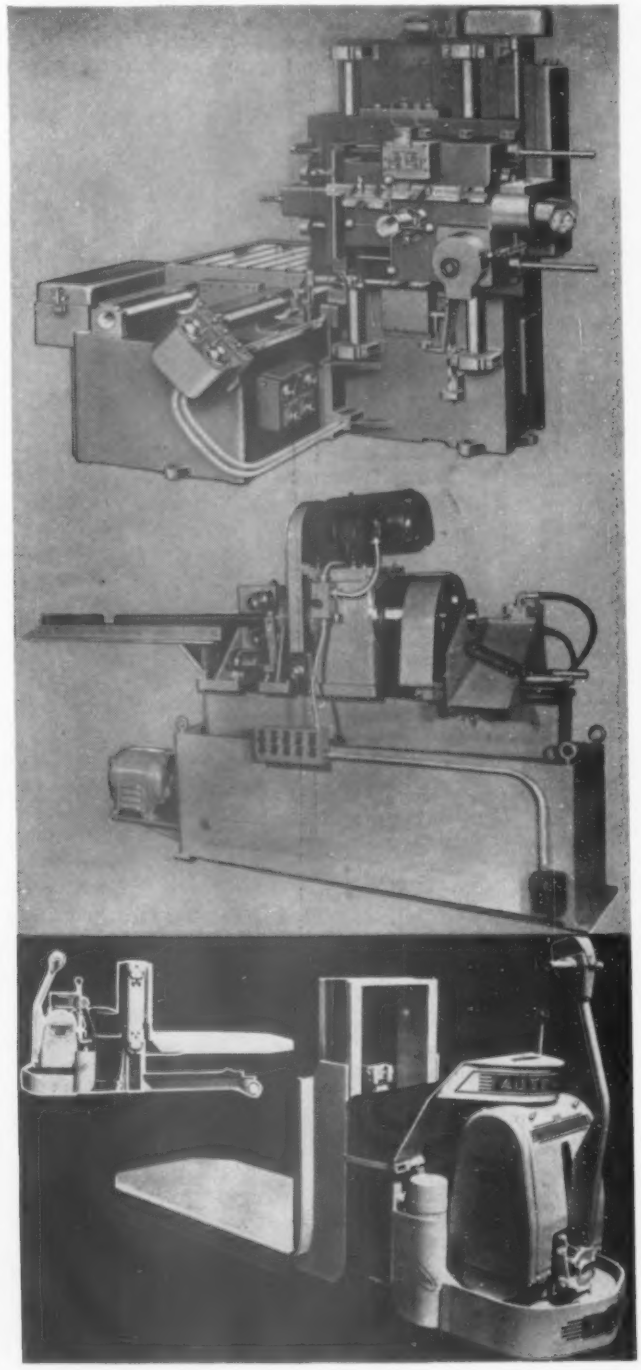
Among highlights of the Show were new ways of doing old things. As, for example, "Vito-shaving" laminated motor rotors (upper photo)) to required close tolerances, a job previously entailing one or two turning operations and a final grind. Lower photo shows a Diagonal Gear Shaving Machine used to precision-finish a helical shifter gear. Both tools are "Red Ring" machines by National Broach and Machine Company, Detroit.



Surface analyzers were exhibited by Size Control Company, together with plug gages; plug gages and sine bars by Taft-Peirce, and precision gages in the manifold exhibits of the DoAll Company. DoAll, incidentally, ran two complete shows, one at the Chicago Dodge plant and one at their home plant in Des Plaines, Ill., where production machines and tool room equipment were shown operated under power.

Press brakes and benders ranged from the bench model Di-acro benders, by O'Neil-Irwin Manufacturing Company to a colossus by Cincinnati Shaper Company, who also exhibited a heavy duty shear, and equipment, along with a h.d. shaper. A squaring shear, for comparatively light material, was exhibited by the Acme Equipment Company.

Among the ultra-new was the No. 20 Man-Au-Trol Locator, by the Bullard Co., Bridgeport, Ct. This 7-ton tool precisely and automatically locates work in relation to a precision horizontal spindle. At center is the new Pines Cut-Off Machine, by Pines Engineering Co., Aurora, Ill. Production of 1500 pieces per hour is claimed for this fully automatic tool. At bottom, the Hyskid Transporter, by Automatic Transportation Co., Chicago, one of many motorized shop trucks shown.



Further, in the line of metal forming equipment was a rotary swaging machine by Langelier Mfg. Company, who exhibited automatic drilling machines as a main line; wire straightening and cut-off machines (also carbide dies) by Dore Mfg. Co.; and multi-slide machines, stock straighteners and an automatic stock reel, for use with punch presses, by the U. S. Tool Company. Of particular interest to this reporter—and, for that matter, to visitors as a whole—was a turret type punch press by Wiedemann Machine Company. It's a cost saver in any press room.

It would be extremely difficult, not to say outright undiplomatic, to single out any one exhibit or tool as superior over another. Practically all tools were complementary to another; each served its purpose and fitted admirably into the general manufacturing scheme. In ambling around, however, one could pick out gadgets here and there that possibly escaped the notice of the casual observer.

For example, magnetic coolant separators, by Barnes Drill Company, dust collectors by Gallmeyer & Livingston and Ideal Industries, and cleaners for removing buffing compounds, by F. E. Anderson Oil Company. These accessories—and similar ones that may have escaped observation—have a considerable bearing on conserving machine tool life. Another tool, of especial advantage in press rooms and welding shops, was a flash trimmer by Morton Mfg. Company.

Transmission equipment, from plain V-belt drives to variable speed transmissions, were exhibited by Dayton Rubber Company, DoAll, Link-Belt and Reeves Pulley Company. Every nationally and internationally known maker of plain and anti-friction bearings had extensive exhibits at the Show, which also included such diversified lines as forging equipment, phenolic plastics, pressed wool felt, and floor cleaning equipment. Screws for every conceivable industrial use, were shown by Parker-Kalon, Bristol Company, Helo-Krome, Chicago Screw Company and Sterling Bolt Company.

Among miscellanea, one found solderless pressure connectors and wiring devices, machine parts by Balcrank; flexible shaft equipment by R. G. Haskins Company, air tools and accessories by Madison-Kipp Corp'n and Mall Tool Company. One also had a wide choice of jig, fixture and die parts and accessories from Acme Industrial Company.

From Allegheny Ludlum Steel Corp'n one had a wide choice of Carmet, tool and high speed steels, and stainless and electrical steels, and from LaSalle Steel Company one could make a selection of La-sulphite and Stressproof steels. From Johnson Bronze Company, and Bunting Brass & Bronze Company, one could select the best in bearings metals, while the Ampco Metal exhibit included an interesting display of alloy centrifugal castings, extruded bars and welding electrodes.

While it has not been the intent to mention all who exhibited—that would take in about everybody "Who's Who" in the machine tool field—or to describe exhibits in detail, this list is nevertheless extensive. Typical tools were shown in the Preview—September *The Tool Engineer*—and others are used to illustrate this article. Others, again, have been shown and will continue to be shown in the Tools of Today Section.

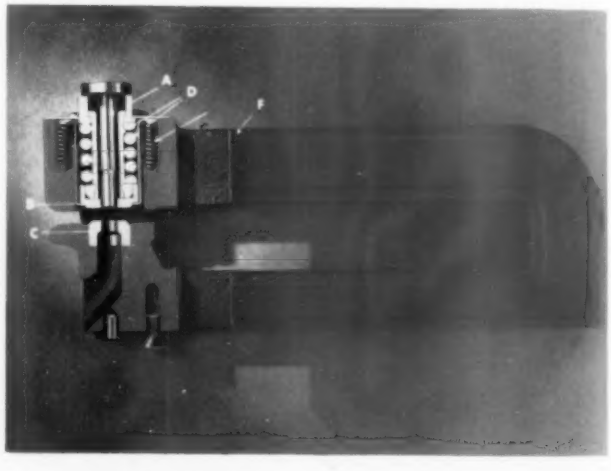
Broader Application for Standard Hole Punching Units

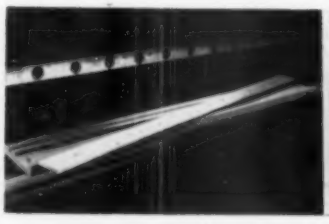
Application of standard Hole Punching and Notching Units, manufactured by the Wales-Strippit Corporation of North Tonawanda, N. Y., may now be further expanded by mounting in press brakes. The method, which is patented by Wales-Strippit, provides for considerably faster set-ups and easier and less expensive storage of patterns in addition to resultant increased output and reduced down-time.

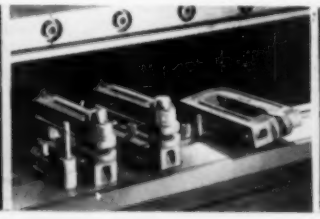
Mounting is by means of "Strip" templates, which fit into a Wales press brake rail, equipped with a T-slot. The rail remains in the press brake when set-ups are changed, the "Strip" templates alone being lifted out of the rail. Dowel or pilot holes, to mate with pilot pins in the self-contained units, are drilled and reamed in the templates at the center of location of holes to be punched.

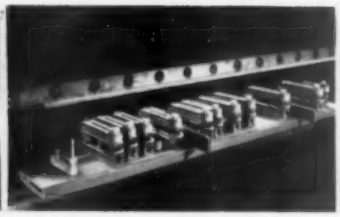
The procedure for making template set-ups is shown progressively, from left to right, in the four small photos, as follows: 1. Layout or transfer hole pattern on "Strip" template; drill and ream .375" dowel holes in center of hole locations, and place the template in the press brake rail, which is equipped with T-slot. 2. Place bolts in T-slot of rail, and set units (either hole punching or notching, or both in combination) simultaneously over bolts and pilot pins in holes in "Strip" template. Bolt Units to T-slot rail. The set-up is now ready to operate, as shown in third photo from left. The photo at extreme right shows mounting plate set-up of Wales Type "BL" hole punching units, and Type "N" notching units, in a stamping press ready to operate.

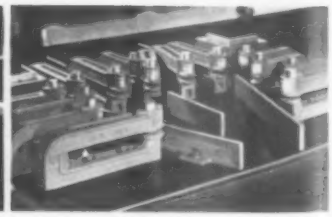
The large photo shows a cross section through the Type "BL" hole punching unit, revealing the relationship of all component parts. In operation, the down stroke of the press ram depresses the punch, *A*, which is guided through the work by the guide button, *B*, and into the die button, *C*. At the same time, the stripping spring is compressed on the stripping guide, *D*, thus lowering the lifters. The holder, *F*, keeps punch and die in perfect alignment.











by **James Walker**

The Techniques of Drawing

Rules and practises for design of dies involving simple and compound operations

Installment No. 7 of a Series on Drawing Die Problems and Formulae

IN THE PRECEDING INSTALLMENT, several methods were discussed relative to cupping operations. When designing cupping dies it must be remembered that the diameter of a cup, or of a drawn shape, should not be reduced more than 50% of the blank diameter in one operation nor, for the usual run of work, not more than 40%. When a cup is reduced to a smaller diameter, the operation is known as redrawing, and the calculations for computing the measurements are known as reduction computations.

The maximum permissable reduction depends largely on the material and its thickness, press speed, type of press, skill, and other considerations. Incidentally, the drawing speed for steel should not exceed 55 feet per minute, while aluminum can be drawn at 100 ft. per min. and stainless steel, brass, and zinc at 30, 150 and 75 ft. per min. each, respectively.

With regard to reduction, it should be evident that a 75% reduction, performed in one stroke, would exert sufficient pressure to push the bottom out of a drawn shape. Therefore, it were better to reduce the shell in several operations—say 40%, 20% and 15%. Assume, for instance, that we have a shell to produce that is 4" in diameter and 5¼" high. Examining a table of approximate blank diameters (found in most handbooks), we find that such a shell will require a 10" diameter blank, approximately. If we assume a 40% reduction of the blank for the cupping operation, then 10.000" x .60 = a cup 6.000" in diameter. The first redraw would be 20% of the cup diameter, and 6.000" x .80 = 4.800". The second redraw would be a 15% reduction of the first redraw, or 4.800" x .85 = 4.080". See Tables 1, 2, 3 and 4.

Calculating Reduction

The procedure for calculating the reduction of drawing dies are as follows: Say that the final shell desired is .025" x 1.200" diameter x 1⅝" high. Then examining a table for blank diameters for cylindrical shells, we find that a shell 1¼" diameter (which is sufficiently close to 1.200") x 1⅝" high requires a blank approximately 3.000" diameter.

The blank is first reduced to a cup 1.850"; and 3.000" minus 1.850" equals 1.150"; then 1.150/3.000 equals 38% reduction. The cup is further reduced to a diameter 1.465"; and 1.850" minus 1.465" equals .385", which reduces to approximately 20% reduction. The final redraw reduces the 1.465" to 1.200" diameter and 1.465" minus 1.200" equals .265", which back down to approximately 18% reduction.

However, the reduction could just as easily have been computed by using the general reduction percentage of 40%, 20% and 15% as follows: A 3.000" diameter blank reduced 40% equals 3.000"—i.e., 3.000" x .60 equals a cup 1.800" diameter. Then, 1.800 reduced 20% will produce a shell 1.440" diameter. The desired diameter is 1.200", therefore 1.440" minus 1.200" equals .240; and .240/1.440 equals approximately 17% reduction.

Some die engineers prefer to compute the reductions opposite to the two methods just described—that is, they work backwards, calculating the last stage first and progressing back to the cupping operation. In this case, the calculations would be as follows: The finished shell measures 1.200", and to increase the diameter 15%: 1.200/100% minus 15% equals 1.200/85 or approximately 1.412" diameter. An increase of 20% equals 1.412/1.00 and this, minus 20%, equals approximately 1.765". Then, the blank diameter is 3.000", and 3.000" minus 1.765" equals 1.235"; thus 1.235 ÷ 3.000 equals approximately a 41% reduction.

Calculating Punch and Die Sizes

Punch and die sizes are calculated as follows: The cupping punch is finish ground to 1.850"; the die is finish ground to 1.850" plus 2t* (5% to a side), or 2t x 10% equals 1.905". The first redrawing punch is ground to 1.465"; the die is ground to 1.465" plus 2t (10%), or 1.465" plus .050 (10%) equals 1.520". The second and final redrawing punch is ground to 1.200"; the die is ground to 1.200" plus 2t (10%), or 1.200" plus .050 (10%), which equals 1.255".

The important factor to achieve is the result and not the number of stages required to obtain it. And while it may be desirable to complete a part in the least number of stages, it is not considered good practice to attempt the maximum reduction at each successive stage. A well engineered job, with properly constructed tools and good material, will keep scrap to a minimum.

High production tools that are responsible for over 5% scrap should be re-engineered. Sometimes, however, it is both difficult and discouraging to "get going" with even excellently designed tools, although consideration with regard to blank-holding pressures, surface finish and lubricants will usually insure success provided that the problem is not one of over-reduction.

Before examining the procedures for redrawing, however, it should be impressed that, when drawing aluminum, the tools should be so designed that the original thickness of the sheet is changed very little. This practice differs from that

*t = Stock Thickness

TABLE 1

Reduction in Diameter for Shells

OPERATION	PERMISSIBLE REDUCTION
Cupping Operation	40%
First Redraw	20%
Second Redraw	15%
Third Redraw	15%
Succeeding Redraws	15%

TABLE 2

Die Dimensions for Drawing Aluminum Rectangular Shells

Cupping Operation	2.2t*	plus Punch Dimension
First Redraw	2.2t	plus Punch Dimension
Second Redraw	2.2t	plus Punch Dimension
Final Redraw	2.0t	plus Punch Dimension

TABLE 3

Die Dimensions for Drawing Steel Shells

Cupping Operation	2.01t	plus	Punch	Dimension
First Redraw	2.01t	plus	Punch	Dimension
Second Redraw	2.01t	plus	Punch	Dimension
Final Redraw	2.0t	plus	Punch	Dimension

TABLE 4

Die Dimensions for Drawing Aluminum Cylindrical Shells

Cupping Operation	2.2t	plus	Punch	Dimension
First Redraw	2.3t	plus	Punch	Dimension
Second and Succeeding Redraws	2.4t	plus	Punch	Dimension
Final Redraw	2.0t	plus	Punch	Dimension

for brass and steel sheet, which may be reduced in thickness as much as 50%. For this reason, it is often necessary to redesign tools used for brass and steel insofar as the clearances are concerned. For those who are not familiar with the design and adaptation of drawing dies for aluminum, the following information should prove valuable.

Aluminum Alloys

The drawing of steel, copper, brass, tin and aluminum articles are produced by the same tools and equipment, and vary only with the lubricant and the clearance between the punch and die. While aluminum is one of the most workable of the common metals, one should not think of it as just one material, but rather as a series of alloys which comes in a wide range of mechanical and physical properties. The characteristics of these alloys, the compositions of which are given in Table 5, affect shop practices and should be thoroughly understood.

These alloys may be classified into two groups; namely, non-heat-treatable and heat-treatable. The harder tempers are produced in the non-heat-treatable alloys by cold working, and the properties of the heat-treatable alloys are increased by thermal treatments.

Non-Heat-Treatable Alloys

The non-heat-treatable alloys, among them Aluminum Company of America's Alcoa 2S, 3S, 4S and 52S, have a wide range of properties. The temper of these alloys is designated as "O" for the annealed or soft material; "H" for the full hard material; "¼H", "½H" and "¾H" for the intermediate tempers. Since these alloys work-harden as they are formed, it is necessary, in severe forming operations, to start with the softer tempers. Less severe forming operations, however, can be done on the harder tempers.

Heat-Treatable Alloys

For many uses, such as for airplanes, busses, railroad cars, ships and truck bodies, the higher strength of the heat-treatable alloys—known as Alcoa 14S, 24S, 61S and 75S—is required. Alloy 24S is heat-treated by heating to 920° F. to obtain solid solution of the alloying constituents, and then quenching in cold water. Full properties are attained until after the material ages at room temperature for four days.

Alloys 14S, 61S and 75S are heat-treated in much the same manner as 24S. The solution temperature, however, will vary for each alloy. After quenching, alloys 14S, 61S and 75S are aged at an elevated temperature in order to obtain their maximum mechanical properties. The temperature and time of aging vary with each alloy.

The tempers of the heat-treatable alloys are designated as follows:

"O"—annealed or dead soft material.

"W"—"as-quenched" from the heat treating temperature.

"T"—full hard temper after room temperature aging, or aging at elevated temperature to obtain maximum properties.

Retarded Aging of 24S

In the discussion of the heat-treatment of the alloys of aluminum, it was mentioned that the full properties of 24S are attained by aging at room temperature. Immediately after the quenching operation, this alloy has good forming properties and can be kept in this condition by holding at a temperature below 0° F. The procedure is to quench the alloy from the heat-treating temperature, place the sheet in refrigerators at 20° F. to retard the aging and thus retain the workability of the "as-quenched" material until ready to do the forming operations. After the part is formed, room temperature aging occurs and the full properties of the "T" temper are attained.

This procedure makes it unnecessary to correct for distortion which may be encountered during the solution heat-treatment of formed parts. If, however, the forming operation is so severe that the use of "O" material is necessary, the part is formed and heat-treated in a way to avoid as much distortion as possible.

The other heat-treatable alloys can be formed more readily immediately after quenching, since some age hardening does occur at room temperature. However, room temperature aging does not proceed as rapidly in these alloys as it does in 24S, and for that reason they usually are not refrigerated to retain the "as-quenched" condition. Alloy 61S-W has the best forming characteristics, while 14S-W and 75S-W are more difficult to form.

Other Factors in Selecting Alloys

In selecting an alloy, factors other than forming characteristics and strength requirements must be taken into consideration. In airplane construction, for example, some parts which are not subject to corrosive conditions may be made of the bare sheet while other parts may be made of Alclad sheet in order to obtain added resistance to corrosion.

TABLE 5—*Nominal Composition of Wrought Aluminum Alloys*

Alloy	*Alloying element, per cent (Aluminum and normal impurities constitute remainder)*					
	Copper	Silicon	Manganese	Magnesium	Zinc	Chromium
2S	..	..	..	..	..	..
3S	..	..	1.2	..	..	..
4S	..	..	1.25	1.0	..	..
14S	4.4	0.8	0.8	0.4	..	..
24S	4.5	..	0.6	1.5	..	..
52S	..	..	..	2.5	..	0.25
61S	0.25	0.6	..	1.0	..	0.25
75S	1.6	..	0.2	2.5	5.6	0.3

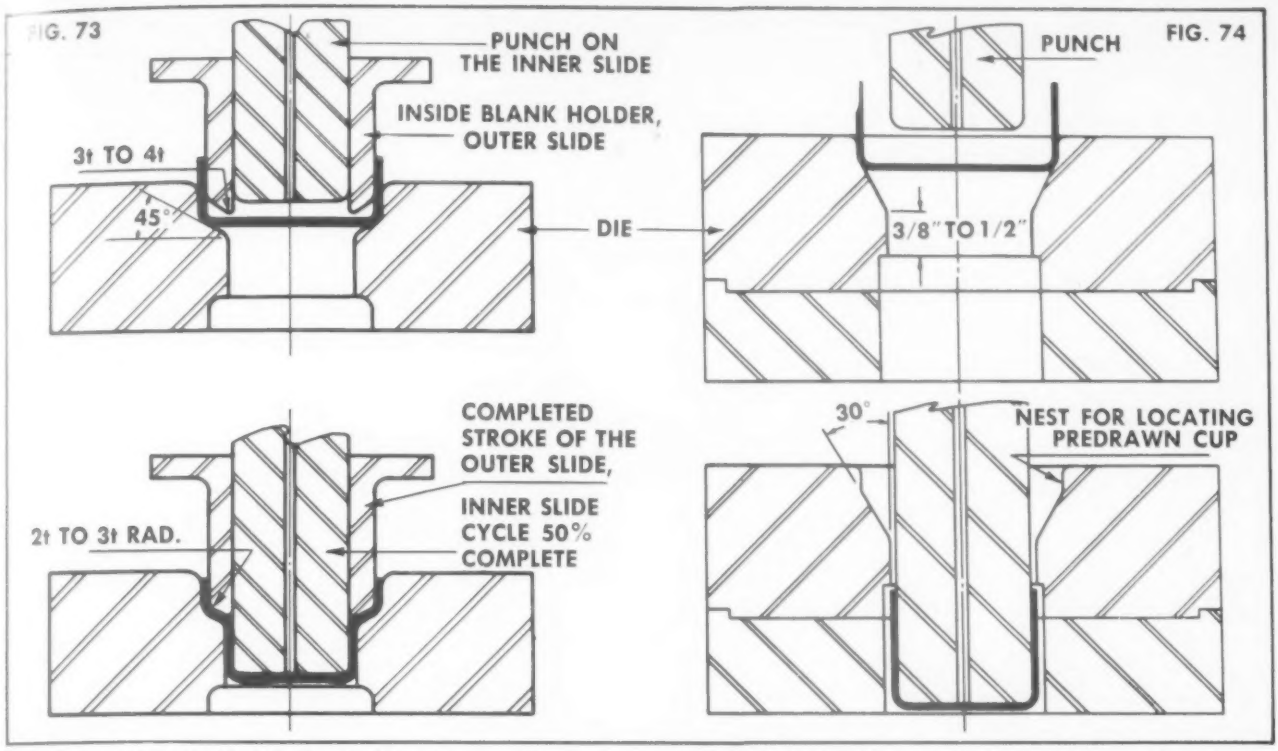
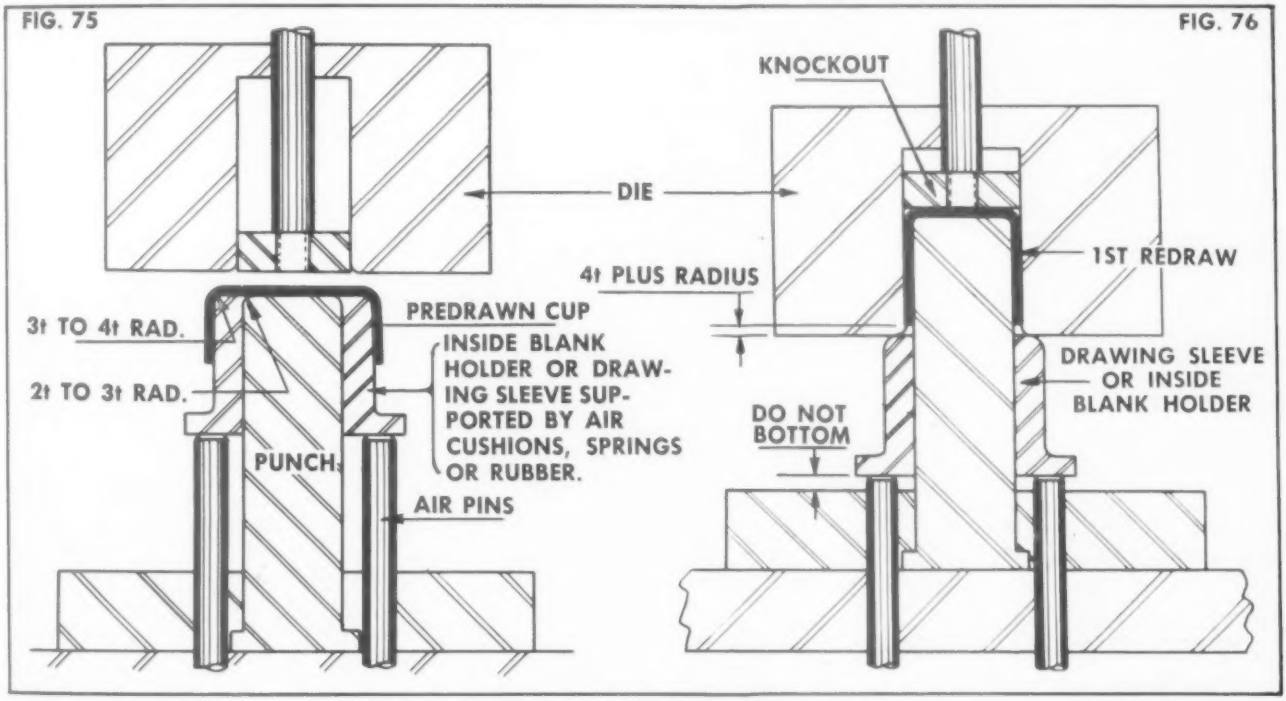


Fig. 73. Die with inside blank holder, double action press. Top, ram starts to descend; bottom, completed stroke of the outer slide. Fig. 74. Push through redrawing. The only difference in this die is the omission of the inside blank holders. Fig. 75, showing first stage for redrawing a cup, single action press. The predrawn cup is nested in the drawing sleeve. Fig. 76 shows the completed cycle.



While not so designated in Table 5, it may be suggested that some of the alloys are designated as *Alclad*. This designation means that a sheet of Alclad 24S, for example, consists of a core of 24S with a thin coating of pure aluminum on each side. This coating protects the 24S from corrosion, not only because it covers the alloy, but also because it provides electrolytic protection on any cut surfaces. The Alclad alloys have considerably better resistance to corrosion than the bare alloys, with slightly better forming characteristics.

Containers, such as shipping drums which are used for transporting chemicals, must have not only the required strength but must also resist the action of the particular chemical to be handled. In such cases, special tests are required to determine which alloy is the most suitable.

Redrawing

Redrawing is an operation which further reduces the diameter of a drawn shape—as, for example, in push-through cupping operations. Again, however, the thickness of the material determines whether it can be pushed-through or has to be supported throughout the drawing operation. Material .093" and over can usually be pushed-through, while thinner materials must be supported to prevent buckling.

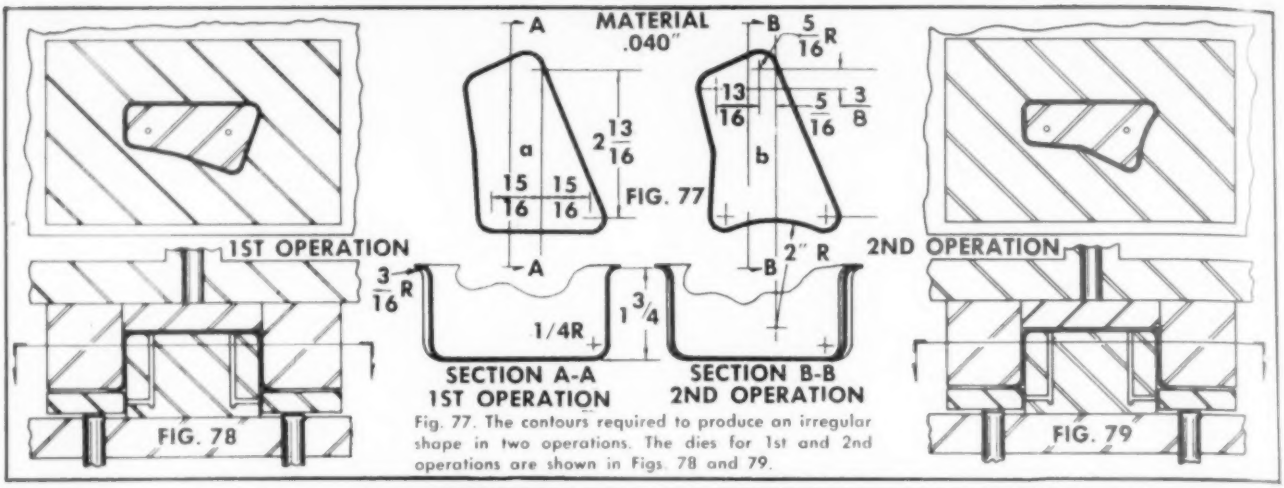
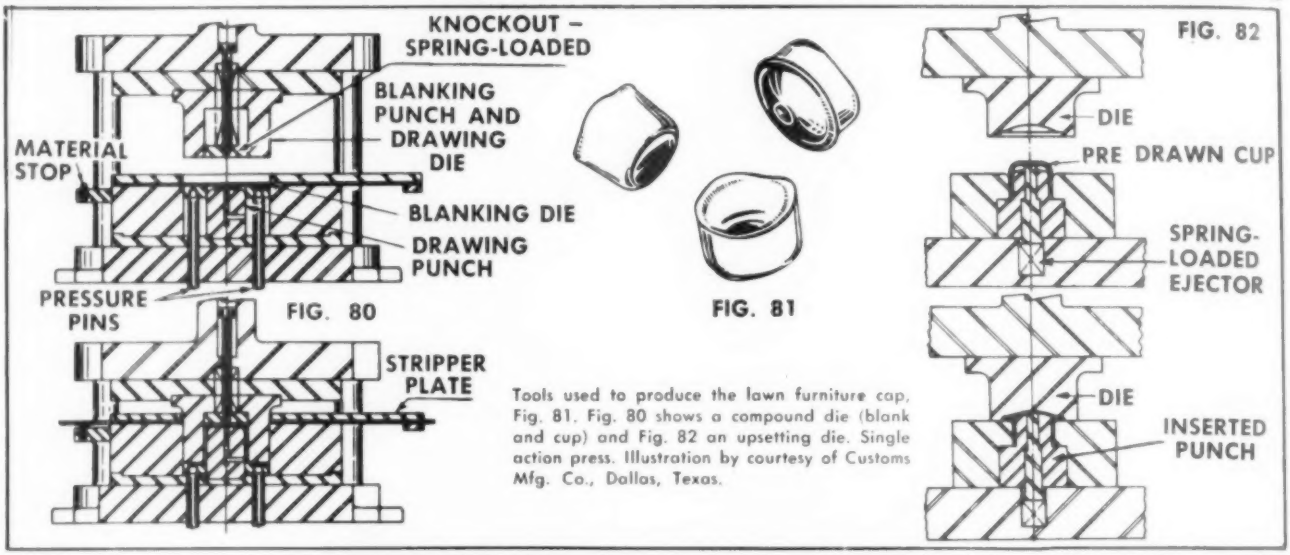
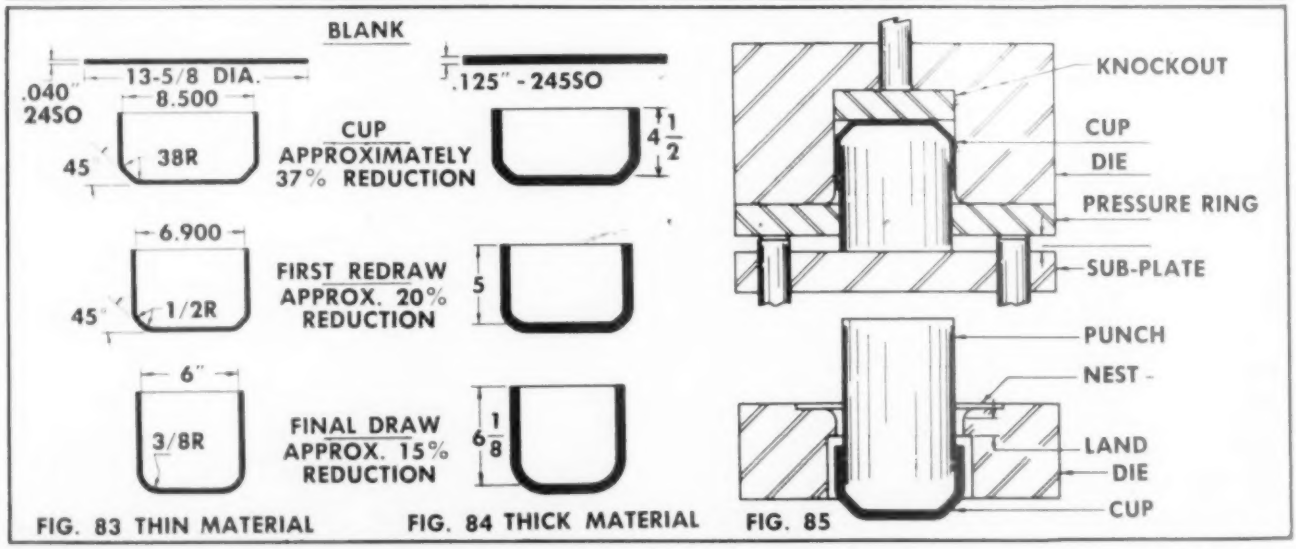


Fig. 77. The contours required to produce an irregular shape in two operations. The dies for 1st and 2nd operations are shown in Figs. 78 and 79.



Tools used to produce the lawn furniture cap, Fig. 81. Fig. 80 shows a compound die (blank and cup) and Fig. 82 an upsetting die. Single action press. Illustration by courtesy of Customs Mfg. Co., Dallas, Texas.



Figs. 83 and 84. Four progressive stages of both relatively thin and relatively thick materials, from blank to final draw.

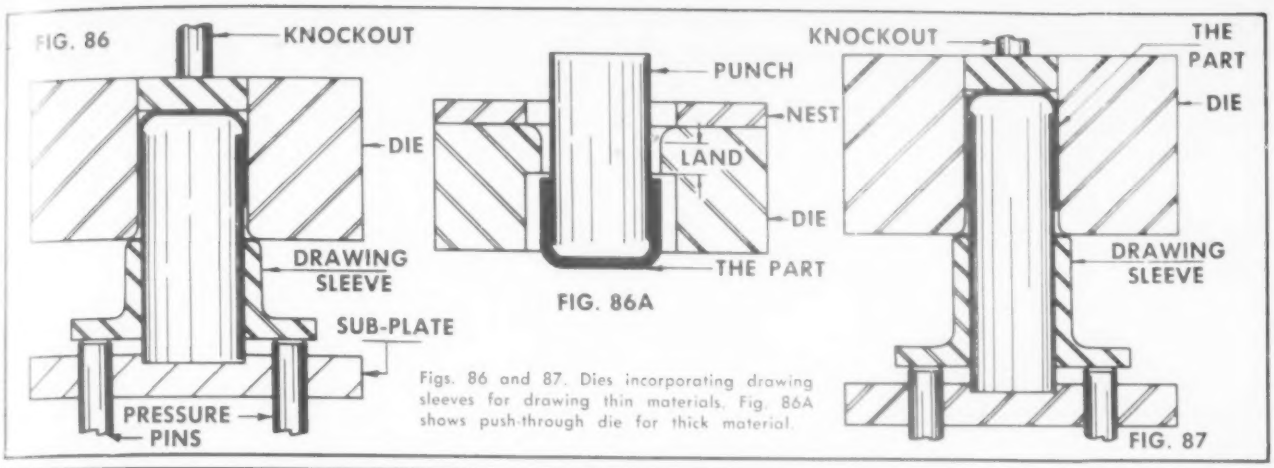
Fig. 85 shows appropriate designs for dies for thin and thick materials from blank to final draw.

Inside Blank-Holders and Drawing Sleeves

There are two good methods for supporting a thin pre-drawn cup during a redrawing operation. The double action press demands one type of design while the single action press demands another.

Fig. 73 shows an inside blank-holder which is generally used for dies that operate in a double-action press. The die has a nest, counterbored in its face to receive the pre-drawn cup, and the tapered entry of the die is usually machined to an angle of 45° on a side. As the ram descends, the outer slide is so adjusted that its extreme travel just barely contacts the portion of the pre-drawn cup.

As the cycle progresses, the inner slide continues its descent until the entire cup is drawn down through the die.



Figs. 86 and 87. Dies incorporating drawing sleeves for drawing thin materials. Fig. 86A shows push-through die for thick material.

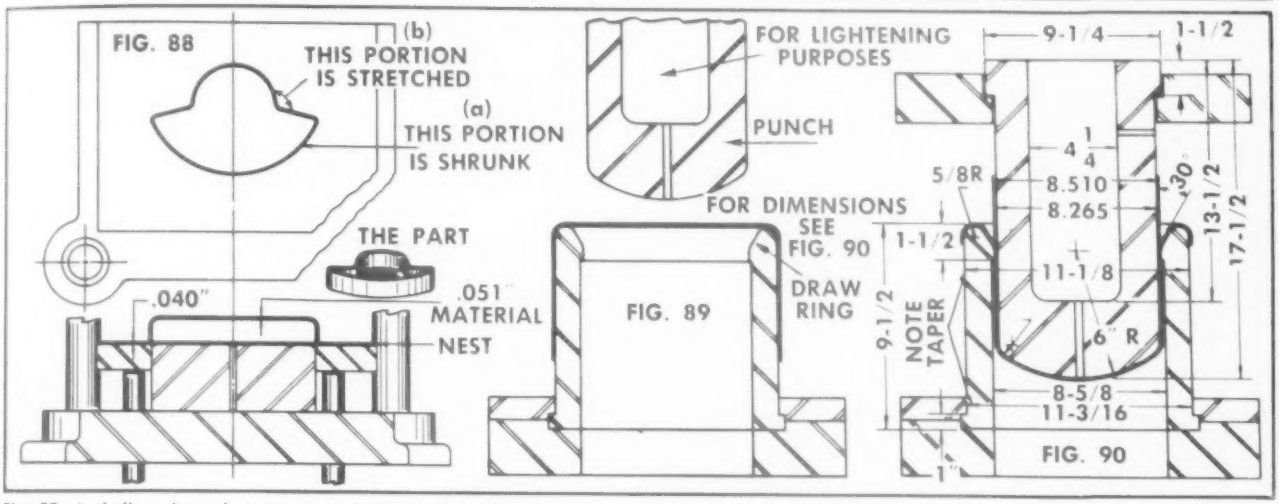
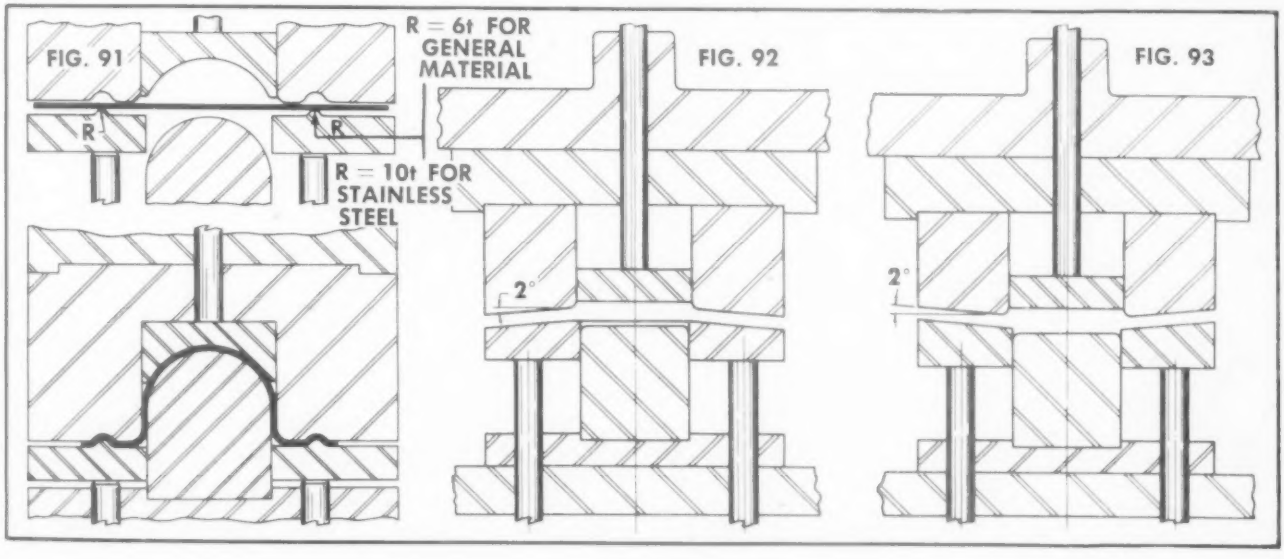


Fig. 88. A shallow draw that represents both a shrink flange (a) and a stretch flange (b). Figs. 89 and 90 show reverse or "inside out" draws. Illustrations by courtesy of American Pulley Company, Philadelphia.

Fig. 91. A die for pinch trimming. Fig. 92, a die incorporating a beaded pressure ring. Fig. 93 shows arrangement for providing additional pressure.



The clearance between the punch and die, lubricant, and the radii of the punch and die, prevent the bottom from being pushed out. The pressure can be adjusted exactly as previously described in the cupping operation; if buckling occurs, increase the outerslide pressure, and if rupture occurs, decrease the pressure. The "land" should be $\frac{3}{8}$" to $\frac{1}{2}$" in length, and when high production is demanded, make use of the positive ejecting fingers.

Redrawing Die of the Push-Through Type

Fig. 74 illustrates a redrawing operation of the push-through type. The die is constructed similarly to the one discussed under double-action press redrawing, which makes use of the inside blank-holder. The only difference is the omission of the inside blank-holder. Of course, the design of the die shown in Fig. 74 is for materials of .093" thickness and up. The amount of taper—which can be varied as de-

sired—is usually 30° from the vertical center line. "Push-through" redrawing operations are much faster than the ejected operations because they eliminate handling the part.

For those who do not have double-action presses, a design such as shown in Figs. 75 and 76 is appropriate. Fig. 75 shows the predrawn cup nested around the drawing sleeve. As the ram descends, the die (which is located on the punch-holder) contacts the cup that is nested on the drawing sleeve. The drawing sleeve can be actuated by air, rubber or springs.

The radii on both the sleeve and the die, in addition to the lubricant, permits the cup to be evenly drawn over the sleeve and down and around the punch as shown in Fig. 76. As the ram ascends, the cup is stripped from the punch by the upward force of the sleeve; then, at the completed cycle, the cup—which sticks in the die cavity—is ejected by the knockout. Both designs are used widely and are capable of producing an evenly drawn cup.

Two Stage Draw Die

The parts print, Fig. 77, shows in detail the contours which were required to produce an irregular shell in two operations. The contour for the preliminary draw is shown at (a), and the final contour is shown at (b). Obviously, the blanking die contour was developed after the first and second operation tools were proofed.

The designs of the two dies are shown in Figs. 78 and 79. There was a nest (not shown) provided to locate the predrawn cup in the final operation. An attempt was made to produce the part in one operation but, due to excessive buckling of the walls, an extra operation was added to precede the final draw. The material was .040″ 24SO Alclad, and the clearance between the punch and die was 10%t to a side.

Fig. 80 and 82 show tools used to produce the lawn furniture cap shown in Fig. 81. The cap, which was subsequently press-fitted in the tubing ends to present a finished appearance, was made from 0.25″ CRS. The first operation (blank and cup) was produced by the compound die shown in Fig. 80. Fig. 82 details the construction of the second operation —i.e., upset and flange.

Attention is called at this time to the "ears"—a term used to describe the unevenness that occurs at the top of a drawn shape—shown in Fig. 81. When they appear in cylindrical drawn shapes they may be attributed, first to an inferior quality of metal, second, to excessive clearance of the tools, or, third, to tools that are in poor condition. The burred portion, being more pronounced in certain portions of the perimeter of the blank, is ironed somewhat causing the excess material to flow upward.

However, ears are not always detrimental, and in this particular case the cap is pressed into the tube, thus hiding the ugly portion. Ears will usually appear in the later stages because of the constant drawing and stretching of the metal and, obviously, will appear more frequently when drawing irregular and rectangular shapes because of the unsymmetrical contour of the blank. Therefore, it is practical to allow sufficient perimeter of the blank when "earing" appears so that an additional trimming operation may be added when necessary.

Figs. 83 and 84 illustrate four progressive stages of both a relatively thin and thick material. Fig. 83 details the various diameters from the blank size to the final draw, and Fig. 84 details the approximate heights of the parts at the various stages. Both parts have the same inside diameters and also represent the punch diameter. To determine the die diameters, see Table 2.

Figs. 85, 86, 86-A and 87 represent appropriate designs for both thick and thin material. The thin material obviously incorporates the use of the drawing sleeves shown in Figs. 86 and 87, while Fig. 86-A shows the push-through type. All components that make up the dies are shown in detail.

Fig. 88 illustrates a shallow draw that also presents both a stretch and a shrink flange. In cases where combination stretch and shrink flanges are demanded, the maximum elongation of the material must be considered as well as the maximum reduction. A shrink flange is one whose contour is convex, as in the case of a cylindrical cup; a stretch flange is one whose contour is concave. Two examples of stretch and shrink flanges are shown in Fig. 88 at "a" and "b". The flange shown at "a" is the shrink flange, and the flange shown at "b" is the stretch flange.

The reason that a combination stretch and shrink flange is more difficult to draw is because of the fact that, if each were formed individually, the construction of one tool would differ entirely from the other. For example, the shrink flange would be designed as previously discussed under cupping operations, and the stretch flange would be designed with a pressure pad actuated inside the die perimeter, and not as a pressure-ring surrounding the punch perimeter. Pressure-pads and pressure-rings are sometimes confused; however, a pressure-pad is one that is actuated internally within a die and is adaptable only for forming and bending operations.

A pressure-ring is actuated externally around the punch and is adaptable for drawing operations. Therefore, the more pronounced the concave of the contour in combination flanges, the more difficult the operation will be because the material is clamped exactly opposite of where it should be. Hence, the material stretch increases not only by the concave contour, but by the additional pressure of the pressure-ring, which is necessary because of the shrink portion of the flange. Also, the stretch increases with the depth of the flange and the decreasing contour radius.

It is practical to vary the clearance between the punch and die for combination flanges, and to allow an additional 5%t where the stretching takes place. In cases of severe stretch, or when the material is tearing, relieving the face of the pressure-ring 20%t where the stretching takes place will also aid in overcoming rupture. The relief should blend smoothly into the level portion of the pressure-ring.

It is worthy to note that the above hints for relieving the pressure-pad were not necessary in this particular case; however, the additional 5%t clearance between the punch and die was added in order to obtain satisfactory parts.

As another worthwhile consideration, always develop the drawing and forming dies before hardening, then, the necessary alterations can be more readily accomplished. In this case, the blanking die was obviously developed after the drawing die was completed.

Reverse Drawing

The designs shown in Figs. 89 and 90 illustrate a reverse-draw commonly known as an "inside-out draw". Reverse drawing is of particular advantage when the increased percentage reduction will finish a piece and thus save an operation. For example, if the blank were reduced 40% in the cupping operation, and an additional 30% was necessary to complete the shell, then a reverse draw would be very satisfactory.

In the case of a conventional draw, 30% would be excessive and probably result in a high scrap percentage. It must be remembered, however, that the design of an inside-out die is more fragile than a conventional drawing die, therefore, it does not have sufficient strength to do any ironing. In other words, an inside-out die does not have sufficient strength to control the wall thickness, thus the metal will thicken more when this type of die is used.

In cases where it is necessary to continue with several further reductions, an inside-out die is not advantageous because it will also thin the metal at the bottom of the shell more than two common draws of about 15% reduction each.

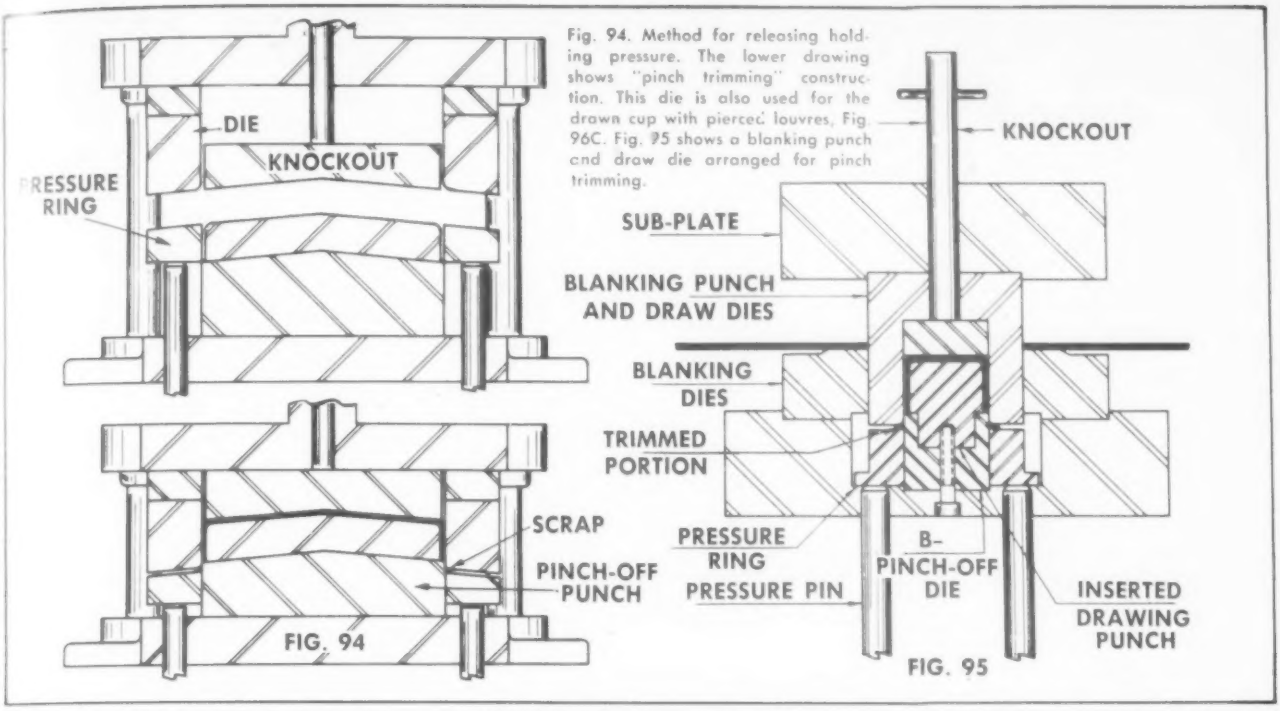


Fig. 94. Method for releasing holding pressure. The lower drawing shows "pinch trimming" construction. This die is also used for the drawn cup with pierced louvres, Fig. 96C. Fig. 95 shows a blanking punch and draw die arranged for pinch trimming.

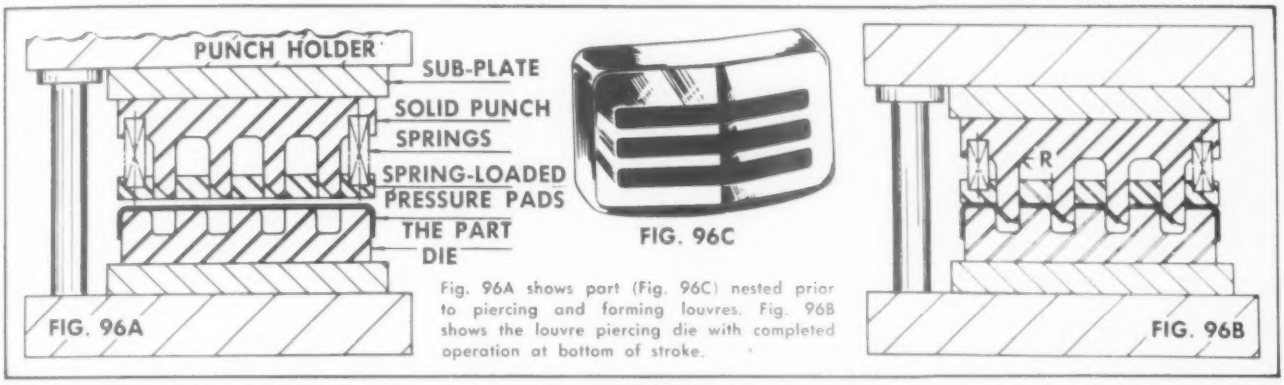
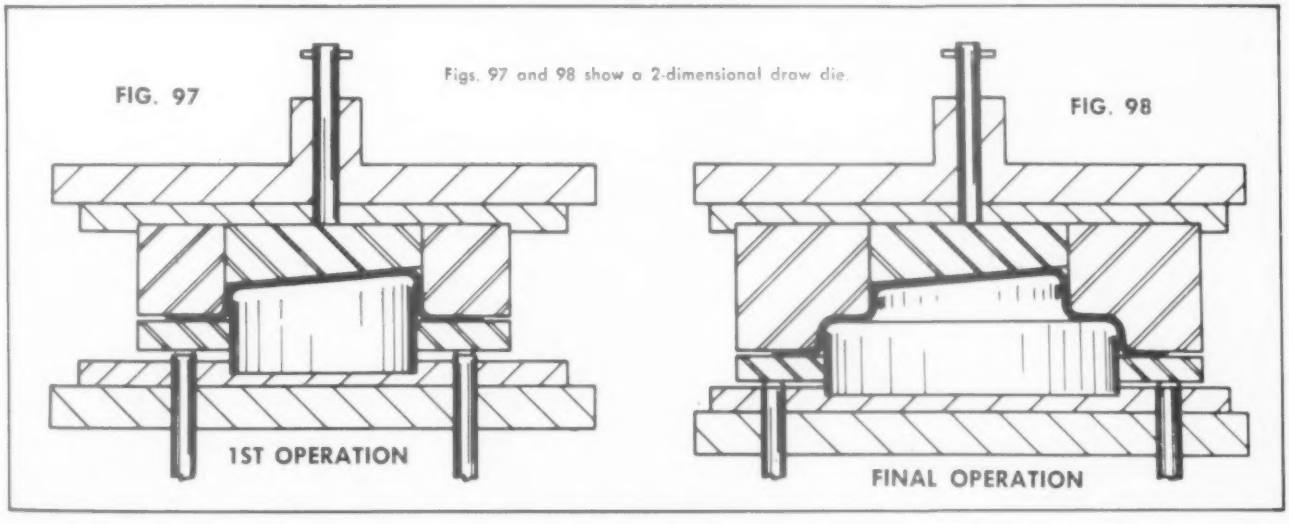


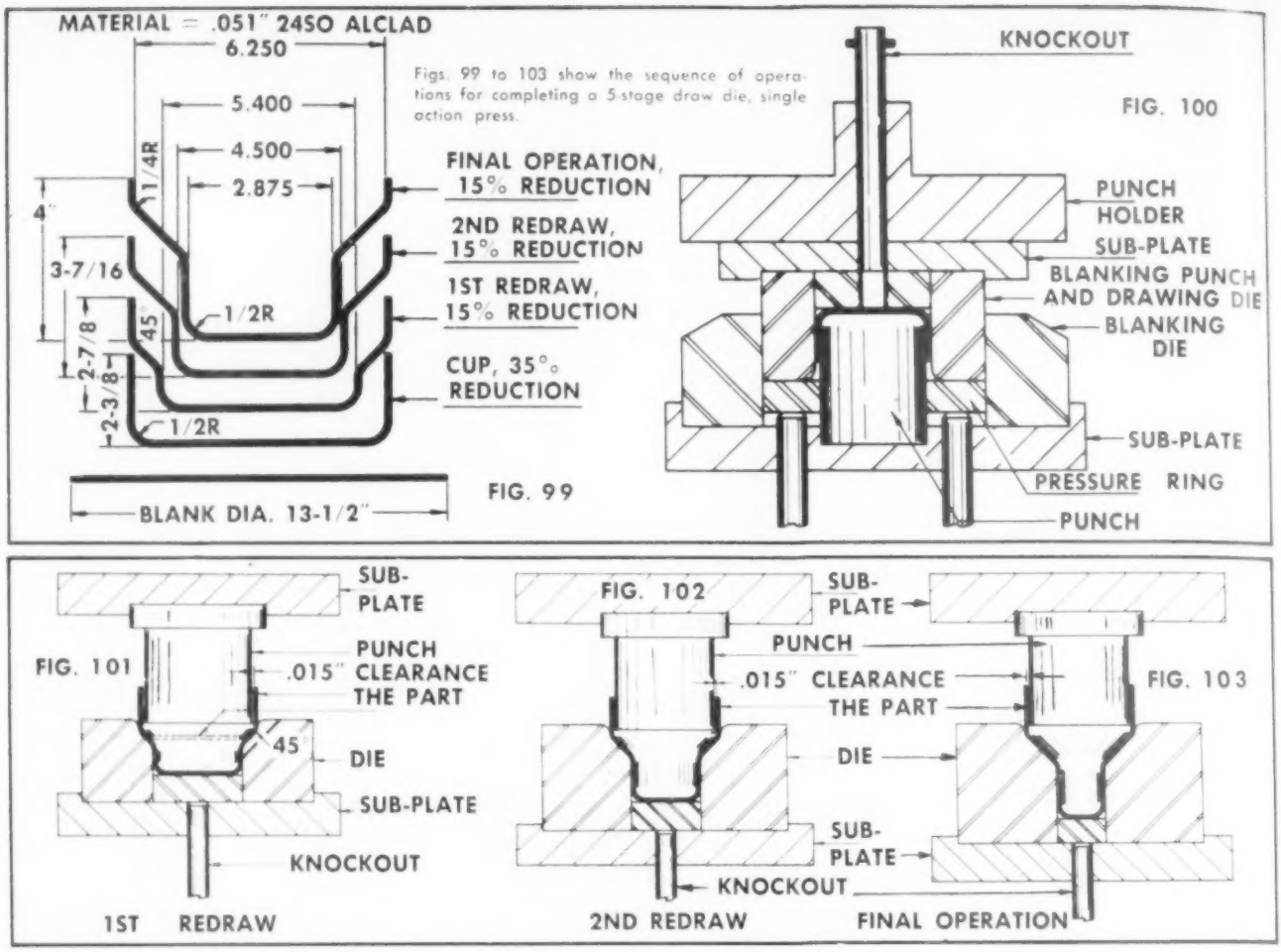
Fig. 96A shows part (Fig. 96C) nested prior to piercing and forming louvres. Fig. 96B shows the louvre piercing die with completed operation at bottom of stroke.



Figs. 97 and 98 show a 2-dimensional draw die.

To obtain a 30% reduction making use of an inside-out die, the radius of the draw-ring, shown at R in Fig. 90, should be approximately 5t. The clearance between the punch and die should be t plus t(12%) to a side.

There is less chance for wrinkles to occur when using an inside-out die because wrinkles tend to occur during compression of the metal; therefore, by making use of the inside-out die, the forces of compression change to those of tension, resulting in a greater degree of elongation of the metals. In operation, the pre-drawn cup is placed over the draw-ring as shown in Fig. 89. The draw-ring is actually a drawing sleeve on the OD, and a draw die in the ID. The punch descends and draws the pre-drawn cup over the radius shown at R, and down through the die as shown in Fig. 90.



Auxiliary Holding Pressures

It is often necessary to provide additional holding pressure over the capacity of the air cushion. Also, it is sometimes necessary to decrease the air pressure under the requirements it takes to hold up the pressure-ring. Some jobs—as, for instance, stainless steel—require tremendous blank-holding pressures, and it is very likely that the desired pressure is beyond the limits of the pressure devices. Conical, large corner radius and hemispherical shells are typical examples where additional blank-holding pressures are necessary.

The design shown in Fig. 92, which incorporates a beaded pressure ring, is recommended when additional holding pressure is necessary to aid in preventing buckling. The radius, shown at R, should be 6t for most materials, and 10t for stainless steel. The action of the beaded pressure-ring is shown in both the open and closed press positions.

Fig. 93 shows another arrangement for providing additional pressure. This method is less severe than the beaded type and the angle of taper of both the die-face and pressure-ring can be varied from ½° upwards. To increase the holding pressure, increase the taper, and to decrease the pressure, decrease the taper.

Fig. 94 shows a method for reducing the holding pressure. For instance, if it takes approximately 20 pounds of air to hold a pressure-ring in position, and 15 pounds is desired, then the angle of taper should be opposite to the example just discussed in the preceding paragraph. The degree of taper can be altered to suit; thus, if more pressure is required, decrease the taper and, if less pressure is desired increase the taper. Note that the results obtained by increasing and decreasing the taper of Fig. 94 are exactly opposite to those discussed of Fig. 93.

Pinch Trimming

In most cases when a part has gone through three or more operations, its edges will not remain of uniform height. Some edges will result as a wavy formation, others will present themselves as "ears", previously discussed. To get rid of the unwanted portion, some shops resort to what is commonly known as "pinch-trimming". A pinch-trimming operation, illustrated in Fig. 95, is usually satisfactory for the average run of jobs. However, it results in a thinning of the metal around the edges of the cup or shell, and also in slightly rounded corners. Pinch-trimming is a very fast operation and also economical, and if the tools are kept sharp, a satisfactory job will result in most cases.

The method of constructing the tool for pinch-trimming is detailed in the design shown in Fig. 95. This is a compound die performing the operation of blank, cup and trim. As the press descends, the material is formed as previously discussed in cupping operation and, as the press nears the bottom of the stroke, the unwanted portion is pinched-off by the hardened and ground bushing shown at B.

The designs shown in Figs. 95 and 97, 96A and B—and also those in Fig. 94—illustrate the manufacturing procedures for producing the drawn cup—Fig. 96—Fig. 96C—with pierced louvres. The blank was developed from the drawing die and, since an even edge was required, a pinch-trimming operation was added. The design of the draw-pinch-trim die is shown at bottom of Fig. 94, while the louvre die construction is shown in Figs. 96A and B.

The springs of the spring-loaded pressure-pad should be medium deflection-high pressure springs, and the radius of the one-piece punch should be as generous as possible to supply additional strength and to help prevent excessive warping in heat treat.

The best method of constructing such an intricate shaped punch and die is as follows: Perform all shaping and machining to within 1/32″ of finish dimensions. Then stress relieve, viz: place the punch and die in the furnace and bring temperature slowly up to 1200° F. Soak for one hour and cool gradually, overnight if possible. However, do not remove from the furnace. Finish machine, then harden. Air hardening tool steel is recommended for both punch and die.

Two-Stage, Two-Dimensional Draw Die

The illustrations shown in Figs. 97 and 98 detail the construction of a two-dimensional draw die. The first operation die—shown in Fig. 97—is similar to that for the cupping operations already covered; however, sufficient flange is provided for in the event a trimming operation is necessary. The final operation, shown in Fig. 98, is clearly detailed; the previous-drawn cup is nested over the two-stepped punch and the final draw is completed.

Conclusion

The following drawings—Figs. 99, 100, 101, 102 and 103 illustrate the sequence of operations for completing a five-stage draw die. Fig. 99 details the dimensions from the developed blank to the final draw. Note that the same OD at the top of each drawn shape is carried out throughout the sequence; also the .015″ clearance, on the redrawing punches, which facilitates removal of the shell from the drawing punch. All component parts are clearly detailed.

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by **Hans W. Smith**

Movement Between Work and Locator

LOCATORS IN BORES are frequently relieved on the sides (Fig. 1) to permit minor movement of the work in the relieved direction while holding the work close on the unrelieved part of the diameter. Sometimes the question arises, "How much movement does the locator permit?" Fig. 2 shows that the distance X is the amount of the movement and can be calculated from the triangle OAC. To simplify the calculation, one half the width of the unrelieved portion is made $\frac{r}{4}$. Therefore:

$$OA = \sqrt{(r-c)^2 - \left(\frac{r}{4}\right)^2}$$

$$AC = \sqrt{r^2 - (r-c)^2 + \left(\frac{r}{4}\right)^2}$$

$$x = AC - \frac{r}{4} = \sqrt{r^2 - (r-c)^2 + \left(\frac{r}{4}\right)^2} - \frac{r}{4}$$

$$\text{or, } x = \sqrt{\left(\frac{r}{4}\right)^2 - c^2 + 2rc} - \frac{r}{4}$$

This formula may be simplified by adding and subtracting the term $17c^2$ under the root.

$$x = \sqrt{\left(\frac{r}{4}\right)^2 - c^2 + 2rc + 17c^2 - 17c^2} - \frac{r}{4}$$

$$= \sqrt{\left(\frac{r}{4}\right)^2 + 16c^2 + 2rc - 17c^2} - \frac{r}{4}$$

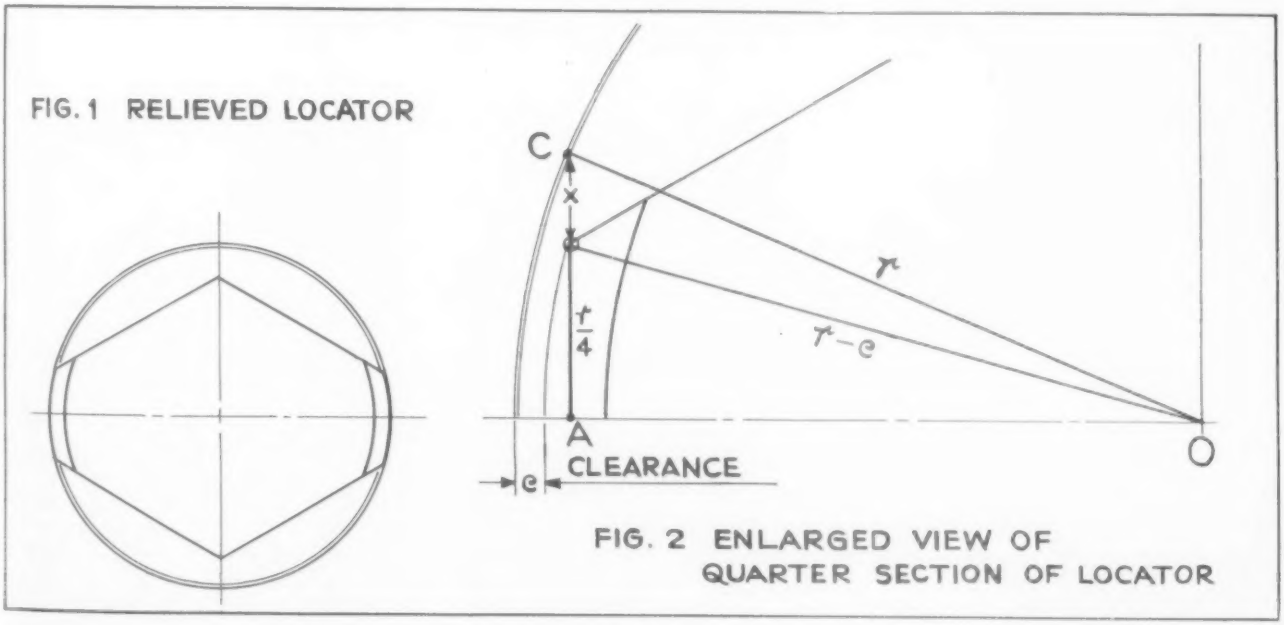
$$= \sqrt{\left(\frac{r}{4} + 4c\right)^2 - 17c^2} - \frac{r}{4}$$

Since, for these problems, c is always a small value (.001″ approx.), $17c^2$ will be around .000017″ which can be neglected against the value of $\frac{r}{4}$. Thus X becomes:

$$x = \frac{r}{4} + 4c - \frac{r}{4}$$

$$x = 4c$$

Thus the movement which the locator permits is four times the amount of the clearance c.



By Karl Stad

Fabricating Hand Trucks by Welding

A production problem solved by use of the "right" electrode

ALL-STEEL HAND TRUCKS, weighing but seventy pounds yet having a load capacity up to 2¼ tons, are now in quantity production at the Tubar Bending & Mfg. Co., Cleveland, Ohio. These trucks, of which two sizes are shown in Fig. 1, are manufactured entirely of high carbon, thin walled tubular steel and therefore weigh less than half as much as hand trucks made of ordinary tubing or of wood.

The use of high carbon tubular steel is normally regarded as exceptionally difficult to weld, and early experiments in fabricating these hand trucks indicated that, because of the low weldability qualities of the high carbon tubing, considerable preheating was necessary and the welding had to be done very slowly. Patently, there was need for an electrode designed particularly for metals of poor weldability characteristics, and the company finally settled on "Shield Arc LH 70," an electrode developed by the Lincoln Electric Company, Cleveland, for weldments of this type. By use of an electrode specifically suited to the job, the obstacles to fast, efficient welding have been quite eliminated.

High carbon steel tubing of two sizes—1 1/16" O.D. and ⅞" O.D.—with a wall thickness of .076"—is used in the fabrication of the trucks. At points of greatest strain, the smaller tubing telescopes inside the larger, thus providing additional strength where needed.

The first step, in manufacture, is the fabrication of the component parts. An oxy-acetylene cutting machine—Fig. 2—is used to cut out the toe-plate sides and the toe-plate front, from ¾" high carbon (45-50 C) steel. The two sides required for each handtruck are then welded to the sharp-edged toe-plate, at the front, which has been forged and beveled.

After having been bent into the desired shapes by a bending machine—Fig. 3—the steel tubing is placed in a jig with the toe-plates—Fig. 4—where the assembly is tack welded to insure location. Cross-bracing tubes, provided to give extra support, are tack welded into place as shown in Fig. 5.

Following this, the frame is placed in a specially-designed rotating jig—Fig. 6—for finish welding operations. The use of a rotating jig permits a maximum amount of fast, down-hand welding. The handtruck frame shown in Fig. 6 is a "stevedore" model, with additional bracing tubes from the kick-bar to the handle. Stevedore adaptation increases the capacity of the handtrucks to a maximum of 2,500 pounds, depending on the size of the frames. The trucks are manufactured in three sizes—50 inches, 55 inches, and 60 inches high. The largest weighs only 70 pounds.

In view of the unusual lightness of these trucks, loads of 1,000 pounds may be handled, without difficulty, even without "stevedore" adaptation.

Specially made rubber wheels, which have a hard rubber core and a soft rubber tire, assure easy movement of the handtruck. The wheels turn on roller bearings which absorb the vibrations from uneven floors and minimize the amount of push-power required by the handtruck operator.

In FIG. 1, upper left, two sizes of the Tubar handtrucks. FIG. 2, above, cutting toe plates in oxy-acetylene cutting machine. FIG. 3, at left, forming truck handles in bending machine. FIG. 4, below, tack welding frame in tack welding fixture—the first operation after tubes are bent and other parts cut. FIG.5, upper right, tack welding cross bracing tubes to frame. FIG. 6, lower right, finish welding on special rotating jig which permits fast, down-hand welding.

By **Merton W. Seavey**

SAE Involute Splines and Applied Involutometry

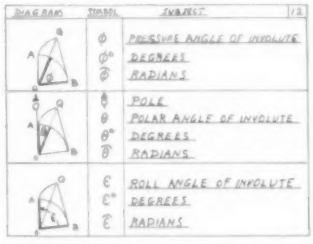
PART TWO OF TWO

DIVISION V: *Directory of Spline and Gear terms by Diagrams and Symbols*

Sketches 12 through 24 show diagrams and the symbols alongside a word description of the function of spline and gear tooth parts. Study them carefully, as you will need them to understand what takes place in the SAE formulas. The heavy lines indicate the part under consideration. Study particularly the symbols, and the identification of the poles.

You will not need all the things shown in the directory to conclude this article, but you may want them if you continue further study. Hence, they are included.

For a clearer understanding, the tooth section in the diagrams have been greatly exaggerated in order to show what is required, also, for ease of illustration, the minor diameter of the tooth is shown as the base circle. However, this condition does not exist in actual splines. The basic reason for creating this directory is to acquaint the reader with the relation of the various gear tooth parts, their symbols, and the *base circle*.



DIVISION VI: *Application of Radians to SAE Formulas of Splines*

For convenience of identification the formulas in the SAE Handbook are identified (1.) through (1.5). For those who do not have the SAE Handbook available, Sk. 25 and Sk. 26 have been provided, showing these formulas. These show the relation of the pressure angles to the pin centers, intersection of the pitch circle and the involute, and to the base circle; also the over or between pin dimensions. Note that, on the external spline, the over-pin dimension is identified by the symbol "C".

When, however, it becomes necessary to distinguish between over-pin dimensions for even or odd numbers of teeth, they are identified by a subscript after the symbol. (Even = C_1 ; Odd = C_2). A similar condition is used for the internal spline, only the symbol "G" is used. In each case the subscript "1" is used for even numbers of teeth and the subscript "2" is used for odd number of teeth. The subscript is required in order to identify just which condition is being used in the formulas.

The pressure angles are also identified with a subscript in Sketches 25 and 26 although, in the actual SAE sketches, the main pressure angle is identified by symbol only (no subscript). It is generally understood that the main pressure angle may be identified in various ways, such as (a) by symbol only; (b) by the symbol and subscript "1" and (c) by the symbol and subscript "M" main pressure angle. On the external spline the pressure angle at the pin center is identified ϕ_2, and the internal spline as ϕ_3. The same identification is used in this article for your convenience.

Let us first consider formula (1). See Sk. 25. It is our immediate objective to show, by diagrams, just what the formula implies. Sk. 25 shows that, to find the measurement over pins in order to check the tooth thickness, it will first be necessary to find the Inv. ϕ_2. Note that in sketches 27 through 30 the poles and polar angles have the same subscript as the Inv. pressure angles. In fact, they are the same (refer to Sk. 5 and note that arc θ = inv. ϕ). The starting point is a radius passing through the center of a tooth on the external, and tooth space on the internal spline.

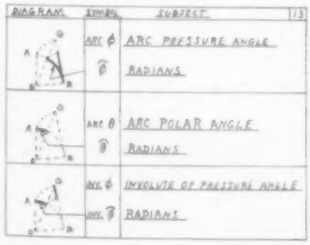
Now that we have knowledge of what is required, let us turn to Sk. 27, the first part of the formula "t/d". Remember that, before we can add or subtract values, we must reduce them all to a common denominator (radians on the base circle); however, we have only certain starting data, such as pin diameter, number of teeth, diametrical pitch, etc. Therefore, we shall have to deal with these.

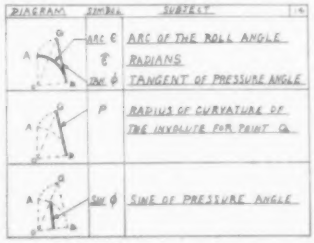
Only Diameters Used

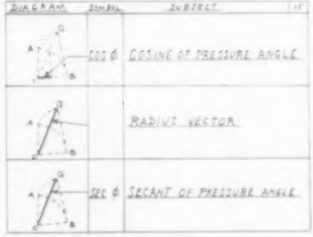
By the way of further explanation, in Buckingham's basic formulas every operation is given in terms of radius, which means that all diameters will have to be divided in half in order to obtain the radius. In the SAE formulas, however, everything has been arranged to avoid such operations; instead, the *diameters only* are used. Now what has this to do with radians? That's what we want to tell you.

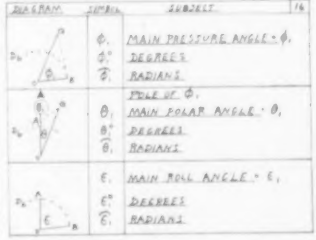
Refer to Sk. 10, and find the note: "Tooth parts symbols". In the first column you will see that the sketch shows the circular pitch "P" in relation to a radius. The second and third columns show other parts by symbols. We also show this again in Sk. 31A. In Sk. 31B we have rotated half the circular pitch around, and we now have a tooth "t" left, and for the first time have a value in radians for an angle expressed in terms of a diameter, and by the symbols "P/D".

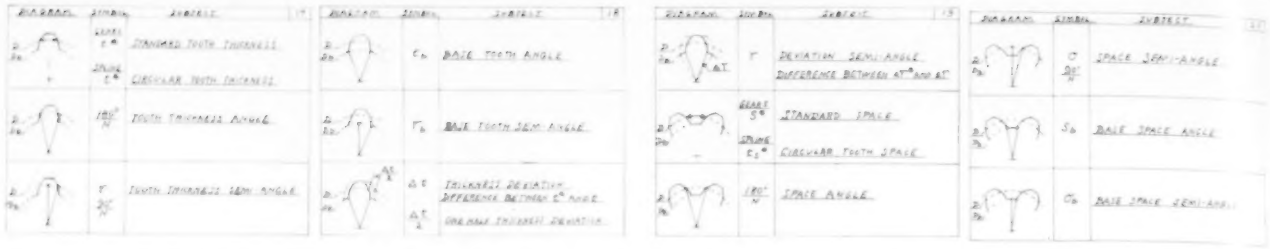
By the same reasoning if we wanted a radian value for one-half a tooth or tooth space, (called a semi-angle) we only need to take half the symbol value of P/D, which is t/D. This is shown in Sk. 31C, also in Sk. 10. In Sk. 31D is shown the base circle. Remember that the angle is the same at the base circle as at the pitch circle. Therefore, if we substituted actual inch values for the symbols "t" and "D", we would have the angle at the base circle in radians. And that is what we started out to do.











Going back to Sk. 25 and to formula (1.), the next group of symbols is Inv. 30°. The radian value for this can be taken directly from the tables, and is given in the SAE Handbook as .053751. The next group of symbols is dx/Db. In Sketches 27 and 28 you will notice the relation of the radius of the pin to the base circle. Remember that we desire everything in terms of diameter. Hence, we now have the formula "dx/Db", and by substituting the correct values we would have a radian value at the base circle.

The next part of the formula says "π/N". Refer to Sk. 10 and in the center column opposite "radians", locate "π/N", and you will also notice that this equals either a tooth "t★" or a space "s★". This would also be the same angle if we used a half a tooth and half a space. Now, to summarize what has been said, refer to Sketches 27 and 28, and see by diagrams what the SAE formula has said. Solve for Inv. ϕ 2. Now in Sketches 27 and 28 you do not find ϕ 2 listed as such, but instead you find θ 2. These are alike. If you are not sure, turn to Sk. 5, and you will remember that Arc θ = Inv. ϕ. Now in Sk. 27 and Sk. 28, follow the SAE formula (1.) right through Inv. ϕ 2 = t/d + Inv. 30° + dx/Db — π/N.

By similar thinking you should be able to solve the SAE formula (1.3) which is shown by diagrams in Sketches 26, 29 and 30, and which start at a central space instead of a central tooth.

If you had substituted actual values and then completed the formula (1.), you would end up with a radian value for an answer. We cannot use this value as is, so, in Sk. 25 directly after formula (1.), there is a note which states: "From Inv. ϕ_2, find ϕ_2 in degrees". This can be done by using the tables. Rarely ever will the radian values be exactly the same number of degrees and hundredths of a degree, so it will be necessary to interpolate for accuracy.

Only Three Places Required

When dealing with degrees, however, it will only be necessary to work to three places to the right of the decimal point. This will give sufficient accuracy for all spline problems listed in the SAE Handbook. It is of interest to note that in the examples listed directly under figures "4" and "5" in the SAE Handbook, that the angles have been carried out to three places.

We will now have to determine which formula to use next. (Refer to Sk. 25.) If the number of teeth in the problem is even, then we should solve the problem for C_1 and use formula (1.1). If the number of teeth is odd, then solve for C_2 and use formula (1.2).

Let's first solve the problem for C_1 using formula (1.1). The formula actually says: $C_1 = Db/\cos \phi_2 + dx$, which can be re-stated Db/Cos A + dx and will soon be explained. Now before we can do this, let us see just what is required, by the use of diagrams and trigonometry. In Sk. 32 you see we want to find the value of "F", and we know the ϕ_2 in degrees and Db, so convert the degrees to the cosine value from the tables. Now consult Sk. 33, and you will see that to find side "c" of the triangle (which is the same as "F" in our problem) it is only necessary to divide side "b" by cosine "A", and is written c = b/Cos A.

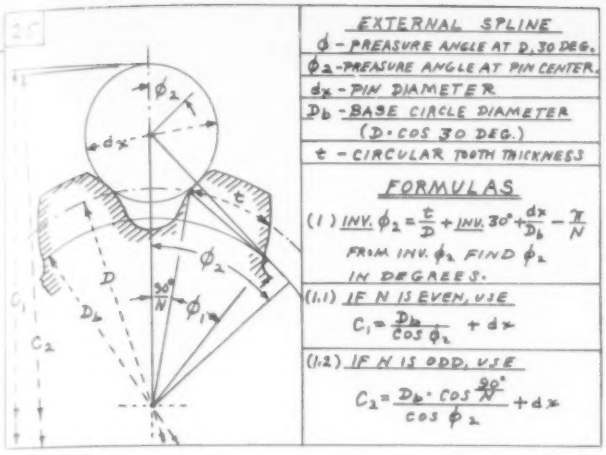
Now, let us write the same thing, only using gear symbols: F = (Db/2)/Cos A. Refer to Sk. 32, and you should recognize that the next step is to find 2 x F, which will equal the distance between the pin centers. To this 2 x F, add two half pin diameters which equal "one pin diameter" and find the dimensions over the pins for an even number of teeth is C_1. Now you have found the dimension over the pins, but you did not exactly follow the SAE formula (1.1). What you used was (Db/2)/Cos A, which means you had to find a radius or the half of the pitch diameter, and this was because you wanted the value "F". Then you multiplied Fx2 in order to get the distance between the pin centers.

Two Operations Saved

We can save two operations and find the distance between the pin centers by merely using the SAE formula "Db/Cos A". This is shown in Sk. 35A, where F and a radius "Db/2" are divided by cosine A. In Sk. 35B notice that 2F is obtained by dividing Db by the cosine A which is what the SAE formula (1.1) says to do. This 2F is equal to the distance between the pin centers, to which we add one pin diameter dx—as the formula states—and you get the answer C_1.

You are now approaching the end of this article, and are well on your way toward understanding why the various symbols are used in the formulas. And there is only one more thing to study; that is, the SAE formula (1.2) to obtain the measurement over the pins for splines with odd numbers of teeth.

Refer to Sk. 36A and observe some characteristics of angles. Notice that Angle "A" is one half of angle "B". In Sk. 36B move the radius vector downward and notice again that angle "A" is one half angle "B". In Sk. 36C the same ratio is expressed in terms of degrees divided by number of teeth, and we can therefore say that the angle made by the formula "90°/N" is one half the angle made by the formula "180°/N". Refer to Sk. 10 to see what tooth parts these formulas represent; then, refer to SAE formula (1.2) to find the over-the-pin measurement for C_2. It is just the same as C_1 except that one more thing has been added. Let us examine them together.



$C_1 = Db/\text{Cos } A + dx$ and
$C_2 = (Db\text{-Cos } 90°/N)/\text{Cos } A + dx.$

The addition is that the Db/Cos A has been multiplied by Cos 90°/N. Now refer to Sk. 37 and you will see, in dotted lines, the distance between the pin centers designated as 2F. Obviously, the lower pin cannot occupy the same place as the tooth, so it will have to be moved over to the space between the two teeth. We now have a triangle in which the long side is known as "2F" and we also know the angle as Cos 90°/N.

Now, refer to Sk. 33 and note that we want to find the short side "b", and the formula says b = C x Cos A. Now, C is the same as 2F in the problem, so after solving the formula all you have to do is to add "two half pins" one pin diameter "dx" as the formula says, and you will have the dimension over the pins for an odd number of teeth "C_2". (See Sk. 38).

The author fully realizes that to obtain consistent results, it is desirable to set down all the data in tabulated form, thus relieving the shop people from having to do any figuring, and especially if it has to do with division. The data can then be readily used by all. However good the intentions, the committee making the SAE Standards must have realized that conditions beyond their control would arise in the shops, such as that the correct size gear pins might not be available for a rush job, etc., so they provided the necessary formulas in the handbook.

The author has also found out that only a very few of the shop people or inspectors could obtain correct answers to a given problem. However, after a little instruction and with the use of a data chart, they were able to get a correct answer. Sketches 39 and 40 show data charts. All that is required is to fill in the spaces provided. For equipment, one needs the data chart, a book of tables to involute functions etc. and an electric calculator; and after a little practice you can do a complete problem in ten to twelve minutes. For practice, it is suggested you take a problem from the SAE Handbook, and see if you can get the same answers as shown in Table 27.

Now that you have progressed this far, the author believes that by further self study you can find out how to solve similar problems for the internal splines. It is suggested you make sketches or diagrams of the individual sections required, then determine the formula for that section. By proceeding in this manner, you will be able to make your own formulas.

DIVISION VII: *Definition of Words Related to Splines*

Allowance — That intentional difference between the maximum external member and the minimum internal member, usually provided for functional reasons such as lubrication. (It is not the same as clearance, backlash or tolerance. See definitions below.)

Analogue Geom. — Proportion; equality of ratios.

Alphabet — See "Greek Alphabet".

Appendix — Matter added to a book but not essential to its completeness, as notes or tabular data.

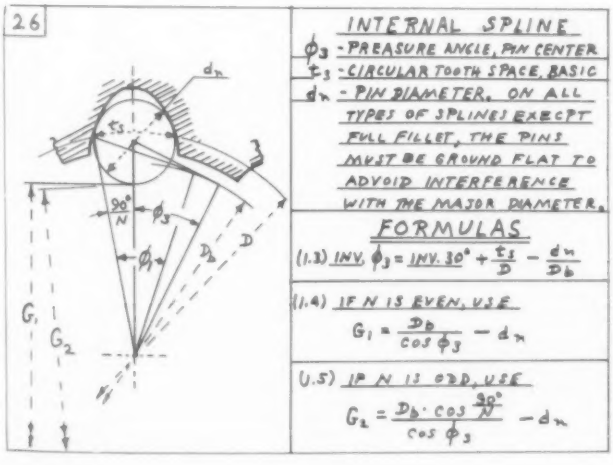
Axiom Math. — A self-consistent statement about the undefinable objects which form the basis for discourse; thus the statement that there is one and only one straight line passing through two given points is an axiom.

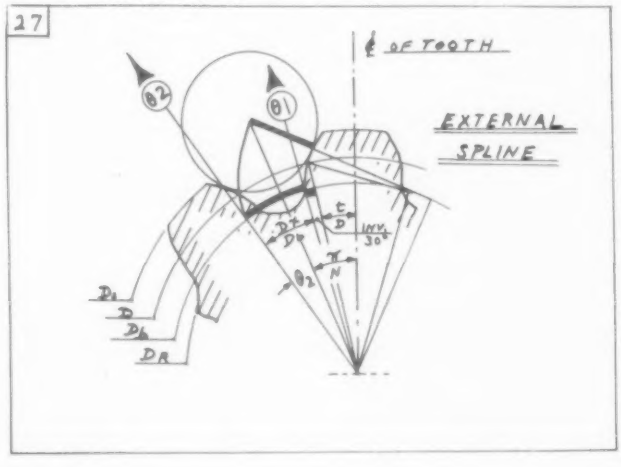
Backlash — See "Circular Clearance".

Bibliography — The history or description of books and manuscripts, with notices of the editions, the date of printing, etc.

Calculus Math. — A method of computation, any process of reasoning by the use of symbols, any branch of mathematics involving calculation.

Circular Clearance — A term used in the spline standard to designate the angular movement of the external member when assembled with the internal member. In gear terms it is called "backlash". (It is not the same as allowance, or tolerance.)

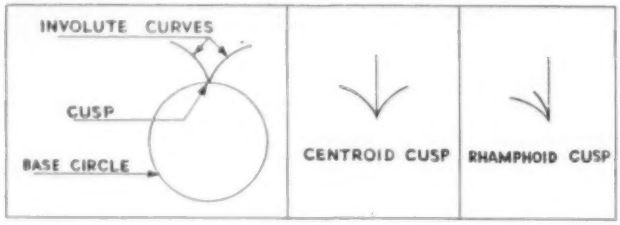




Congruent Geom. — Superposable so as to be coincident throughout.

Coordinate Math. — Any of a number, usually a system, of magnitudes that characterize the elements of an angle, or set, so as to distinguish one from the other; specifically, any of two or more magnitudes that determine position, especially of spatial elements, as of points, planes, etc.

Cusp Math. — A double point consisting of the coincidence of two consecutive points of a curve regarded as a system of points, where the tracing point stops moving forward and begins moving backward; called a centroid or rhamphoid, according as the tangent lies between or outside the adjacent parts of the curve.



Degree Trig — A 360th part of the circumference of a circle, or of a round angle, which part is taken as the principal unit of measure for arcs and angles. All angular degrees are equal but arc degrees vary as the radii of the circles.

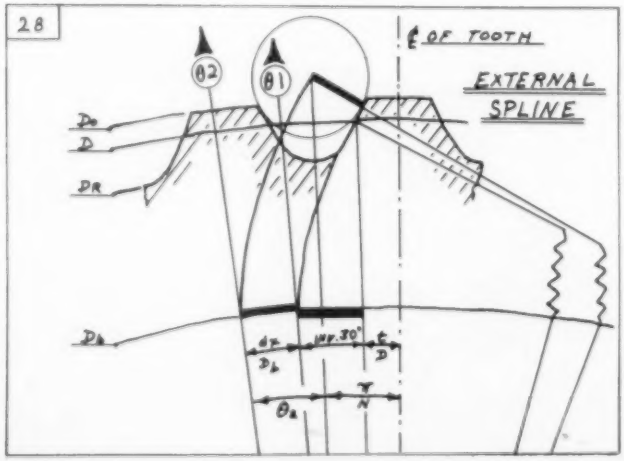
Equation Math. — An expression of equality between two magnitudes or operations, the sign = being placed between them.

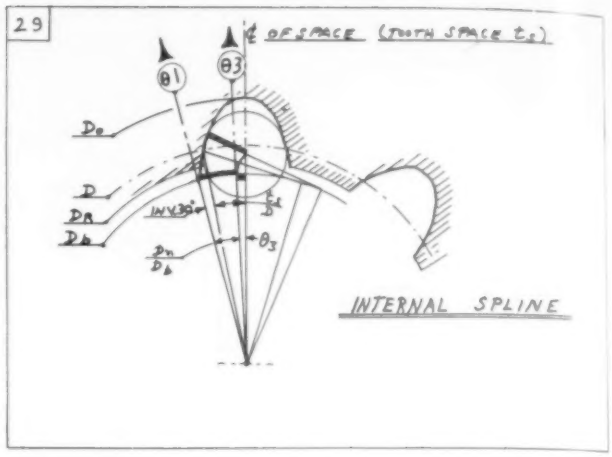
Equidistance — Equal distance.

Evolute Geom. — The locus of the center of curvature.

Formula Math. — Any general fact, rule or principal expressed in algebraic symbols.

Greek Alphabet — Only the letters used in this article are given here with their names: Δ Delta; ε Epsilon; θ Theta; π Pi; σ Sigma; τ Tau; φ Phi.



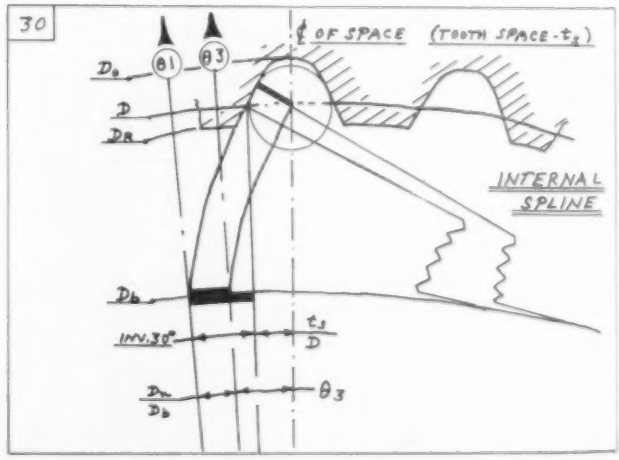


Inverseley or Inverse Math. — Opposite in nature and effect; said with reference to any two operations which, when both are performed in succession upon any quantity, reproduce that quantity; as division is the *inverse* operation of multiplication.

Involute Geom. — A curve traced by a point of a perfectly flexible inextensible thread kept taut as it is wound upon or unwound from another curve (called the evolute), or the path of any point of a tangent that rolls without sliding round a curve. (Ref. Sk. 2.)

Involutometry

1. *Plane Involutometry* is the art of measuring and calculating the involute of a circle, just as "trigonometry" means the art of measuring and calculating triangles.
2. *Solid Involutometry* is involutometry of space; it is the involutometric analogy to solid analytic geometry.
3. *Applied Involutometry* is the art of applying plane and solid involutometry to technical problems, usually requiring additional specifications, which may be independent of the laws of involutometry. (Gear, gear tools, and spline designs and measurements are at present the main fields of "Applied Involutometry").



Locus
Math.

The path of a point or curve moving according to some law; the assemblage of all possible positions of the moving or generating element. The law is commonly stated by an equation or equations connecting the co-ordinates of the moving element. Hence any assemblage of elements determined by equations among their co-ordinates.

Mathematics

The science which treats the exact relations existing between quantities or magnitudes and operations, and of the methods by which, in accordance with these relations, quantities are sought and deductible from others known or supposed.

Mil

A unit of angle measure, equal to 1/64000 of a complete revolution, .05625°, and nearly 1/1000 of a radian. Used by U. S. Artillery for fire data.

Parameter
Math.

An independent variable through functions of which may be expressed other variables, as the co-ordinate of a locus.

Pitch Line
(Gearing)

The line on which the pitch of teeth is measured; an ideal line, in a toothed gear or rack, bearing such a relation to corresponding line in another gear, with which the former works, that the two lines will have a common velocity as in a rolling contact. The line in a circular gear forms a circle (pitch circle) concentric with the axis of the gear.

Pole
Math.

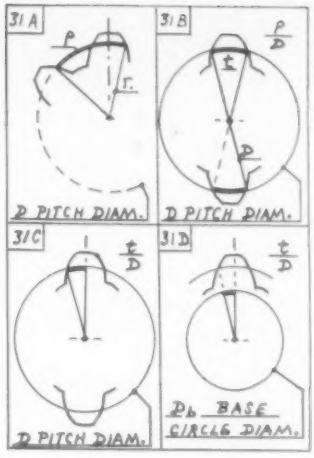
The vertex (in a plane) of the pencil of lines in that plane that belong to a given linear complex.

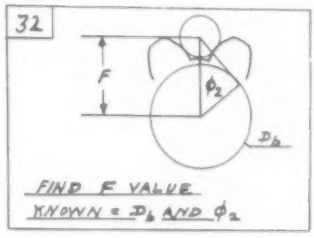
Proportion,
Math.

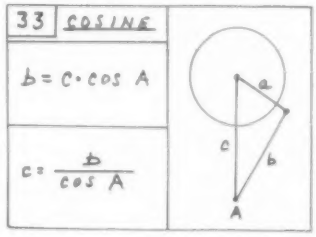
The equality of ratios.

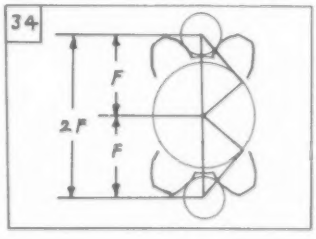
Proposition,
Math.

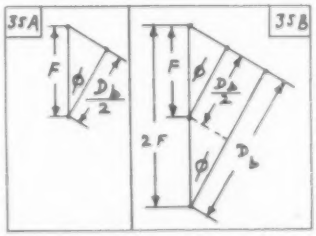
A formal statement of a truth to be demonstrated or an operation to be performed,—in the first place called a theorem; in the second, a problem.

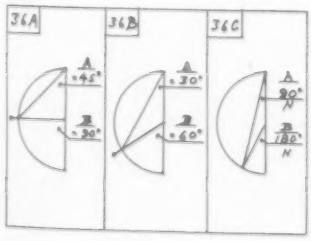


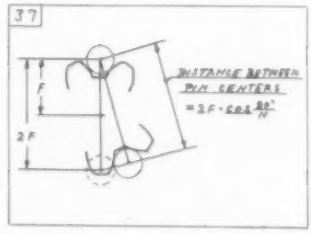


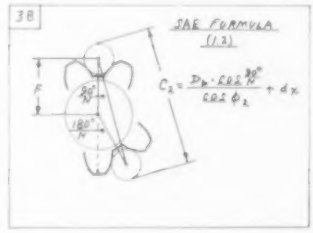












Radius Vector

A straight segment (or its length) from a fixed point (or pole or center) to a variable point. (Ref. Sk. 5, line O-A)

Sexagesimal

Meaure of an angle.

Spatial

Of or pertaining to space; occupying space; occurring in, or conditioned by space; considered with relation to space.

Spline
Math.

Usually a number of equally spaced grooves (called spline ways) are cut into a shaft so as to form a series of projecting keys, the whole fitting into a grooved internal cylindrical member.

Subscript

Written below or underneath (Math.) as a sub-index.

Symbols

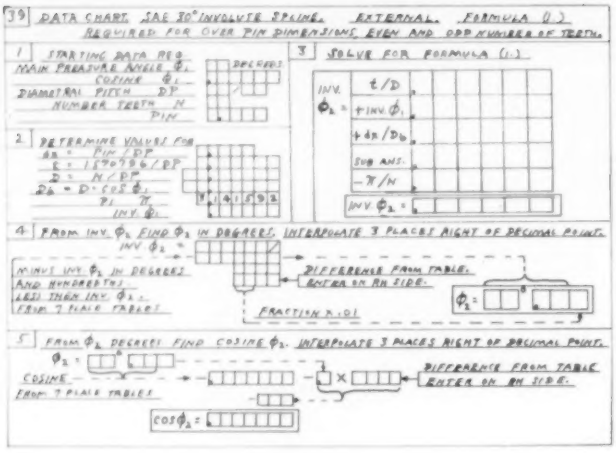
Seconds ″	$\overset{\frown}{\phi}$ Arc Angle—in radians
Degree °	ϕ Angle, and involute angle
Minutes ′	Δ Delta
Arc ⌒	ξ Epsilon, involute angle
Standard ★ item such as tooth or space	+ pole angle
	θ Theta, pole angle
	π Pi
	σ Sigma
	τ Tau
	ϕ Phi
	ϕ° Angle in degrees

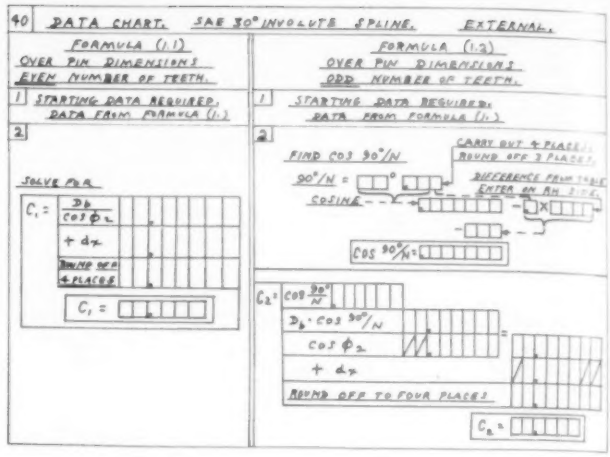
Tolerance
Math.

The difference between the two limiting sizes as a means of specifying the degree of accuracy. Tolerance is distinguished from allowance in that the former is merely a specification of the required degree of accuracy of the part, whereas the latter is a difference between the dimensions of mating parts which is essential for successful functioning.

Transcendent

Transcending or going beyond what is given or presented in experience.





Trigonometry — That branch of mathematics treating of the relation holding among the sides and angles of triangles and among closely related magnitudes, and especially of methods of deducing from given parts other required parts, and also of the general relations connecting trigometric functions of arcs or angles.

Unit — A standard of measurement such as an inch, a foot, a pound, etc.

Unit Circle — A circle whose *radius* is one unit. (One inch, one foot etc., depending upon what system of measurement is being used).

DIVISION VIII: *Manufacturing and Gaging Problems*

The manufacturing and gaging problems are outside the scope of the SAE spline data. However some helpful suggestions are given in the various appendices.

For a general basis of discussion on the subject of manufacturing and gaging of splines, read the *Discussion of*, and *Engineering of Involute Splines*, in the SAE Journals. (Ref. Division IX, Bibliography.)

DIVISION IX: *Bibliography*

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Discussion of Engineering of Involute Splines, SAE Journal, Vol. 54, No. 6, June 1946.

As a concluding note, to this article by Mr. Seavey, it should be stated that it is not to be considered as an original work *per se*. Rather, it is written with the purpose in view of enabling shopmen, unversed in advanced mathematics, to better understand the formulas involved in calculations for the Involute Spline, now assuming vast importance in industry.

The author wishes to gratefully acknowledge all sources on which this article is based, all of which are included in the Bibliography. This refers particularly to the system of definitions, terms and symbols of involutometry, applied involutometry, and the gear terminology which, in many instances, are verbatim quotations from the book "Involutometry and Trigonometry" by Dr. W. F. Vogel and published and copyrighted by Michigan Tool Company, Detroit.

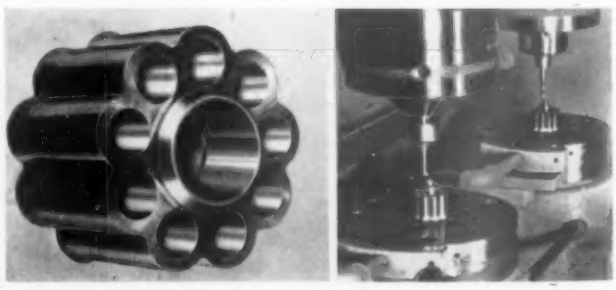
Thus, many of the illustrations, as, for example, Figs. 5, 6, 7, and Figs. 10 to 38, are frankly sketchy as compared to the finely executed originals which were taken from the book "Involutometry and Trigonometry."

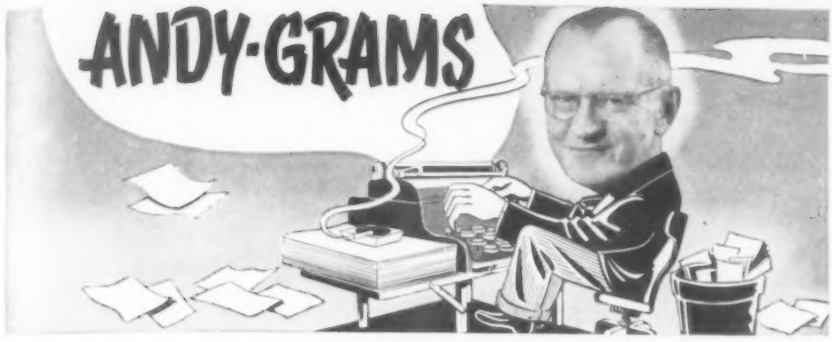
The Editors

Better Holes with Solid Carbide Boring Tools

DIFFICULTIES IN HOLDING desired tolerances (.0002" to .00005") when boring 3/16" dia. cylinder holes in the bronze body of an hydraulic pump, by a wid-west manufacturer, were overcome by the use of solid Carboloy cemented carbide boring bars. The part, with length to diameter ratio 6:1, is shown at left in photo, while the simple and very interesting fixture setup is shown, at right, mounted on a 2-spindle vertical boring machine.

Cutting at 270 FPM, with feed of .0021" per revolution, the tools produced very smooth, straight holes, well within the specified tolerances. They eliminated tapered holes, chatter and tool failure—main causes of original difficulties.





FOR THE BENEFIT of all and sundry who have accused me of faking the hairs on my head (see title block above) let me say that they're all there. Sure, Nik Varkula (our art director) darkened 'em up a bit—or so I suspect—but then, so what? All that aside, the hirsute growth is the result of an invention I told the Peoria boys about a while back. Y'see, you take a hair, double it and stick the free end in the scalp. Then, when it takes root, you snip it in two and, presto!—you have two hairs where only one grew before. A swell idea—if it works.

From one thing to another, my dogs are restored to near normal now that the Chicago Show is history. History, but not forgotten. Personally, I believe that I visited every exhibit in the Show—some many times over—but even ten days wasn't enough for more than a nodding acquaintance with many of the tools shown. To my regret, I didn't get around to any of the other shows, running concurrently. Started to, but got sidetracked; however, Clarence Etter spelled me on that. With teamwork, we got around to about everything between us.

As previously stated, the big exhibits were jammed, but that does not imply any lack of interest in the smaller displays. As an interesting item, I breezed in to the C. A. Norgren exhibit just as a guy came in . . . let's see, now? . . . Oh yes, Bill Herricks, his name is, connected with the Herricks Engineering Research Bureau of Stamford, Ct. Anyway, he had the nearest thing I've seen yet to perpetual motion, a mercury operated bilge pump, for boats, that works itself with roll of the vessel. Only trouble was dirt in the bilge water fouling the pump, and he was getting together with the Norgren outfit to lick the trouble. And, as I got it, Norgren had the answer in one of their valves, so the problem was just about settled then and there.

Of course, you might say that the Show is all over, so why bring that up now? But an exposition as big as that doesn't die overnight, especially so since most of the exhibitors will be busy these many moons trying to catch up on orders accrued. Almost everybody I talked with reported "Big Business," and the most conservative comment—and that on the third day—was: "Well, at least I've cleared expenses." Both visitors and exhibitors kept buzzing me about the ASTE Show, scheduled for next March in Cleveland, and from what I could gather that event promises to be BIG! Anyway, Harry Conrad and the boys in the "front office" are hard at work to make it a huge success.

One exhibit, that interested me plenty a/c my yen for guns, was a big Lapointe broaching 22 calibre rifle barrels. A beautiful job, and the wonder of it was that the tiny (in section) broach didn't break under the strain. Oh, I tell you, the broach makers have come a long way during the past several decades.

Looked for Sundstrand's Ed Dickett in the crowd, but no see. Also for Plan-O-Mill's Harold Norberg, but met the "old man"—J. Hugo Smith—instead. Gene Bouton, with whom I renewed the feud re plain and ball bearings, and so on one after another old timer in endless procession. Larry Rademacher, big as life and twice as natural, and, during the rounds, Hill & Knowlton's Len Church, seriously intent on looking after the interests of his clients. For that matter, about everybody had that objective look.

One thing I did run across was that machine for simultaneously milling and drilling electric motor bases that I asked you boys North, East, West, South to trace for me. Perseverance wins—even to locating the proverbial needle in the haystack.

Praise, when deserved, never hurt a willing worker, anent which a comment by Laird deVou, treas'r of Johnson-deVou, Inc., may well be passed along. He came up to me at the Boston meeting, in September, and said, in gist: "I want to tell you that you've got one swell guy in Vic Ericson. He is one of the finest men I've ever known and as square as they make 'em." A fine compliment; however, I imagine that the boys in the front office had considered all that when they elected Vic Nat'l Treasurer.

Well, the Boston Tea Party will be history by the time that this gets to the readers, and coming 'twixt two months as it does, there's little to be said about that at this time. Doris Pratt has given you all the dope in her usual masterly style, and the turnout should be BIG. Or should I say "should have been big?" My prediction, written several weeks ahead of time, is that it will have been big. Right?

From one thing to another, one of the local boys wanted to know why I never mention Detroit Chapter, especially so in view of the publicity given me, in the monthly bulletin, anent my winning the set of golf clubs last summer. How was it it ran? . . . "we hope Andy will know a fairway from a bunker" or something like that. Now, was that nize? To set all minds at rest, however, I once made a hole in one—and then quit. Why spoil a reputation?

It happens, however, that I thoroughly enjoy getting together with the boys of my home Chapter when occasion permits. But, for the past several months I've been out of town during meeting nights, and a guy just can't be in two places at once. Now, looking through Detroit's October bulletin, I see where the Chapter officers have arranged a series of lectures that promises considerable interest and which, in my opinion, warrants an impressive attendance.

First in line was Past Prex Otton Winter—and I attended that session—who posed the question :"What is Tool Engineering?" Well, the answer to that just about takes in the waterfront. Also on the list is Vicker's Rudy Esch, who will show how "Hydraulics (are) Applied to Machine Tools," and "Cutting-Tool Design" by Harry Gotberg of Colonial Broach and A. P. Smith of Eclipse Counterbore. Good men, both of 'em. So is University of Michigan's Prof. O. W. Boston, who will speak on "Machining of Metals."

Bill Smila is to head an Invitational Round Table on "Developments in Standard and Special Machine Tool Design," with Cincinnati Milling's Swan Bergstrom, National Broach Company's Ben Brege, Ralph Cross of the Cross Company, Jones & Lamson's John Lovely and Herb Tigges of Baker Brothers and the ASTE in general. A fine slate of speakers, well qualified to handle an interesting subject. Incidentally, I haven't seen Swan Bergstrom since he came all the way from Cinci to buy Christmas *lutfisk*—or was it glög?—several years ago. Oh sure, he was big guns at the Chicago Show, but we didn't happen to be in the same spot at the same time.

I see by the ASTE News that the boys down in Toledo gave a big blowout for Al Schmit, retiring Director. A deserved tribute to a swell guy who, like many others, has given time and thought to the propagation of tool engineering and the ASTE. Y'know—but wait a minute 'til I count my lines! Nossir, this is the end, so here comes the final ●

ASTEely Yours

Andy

P.S. Some day I'll tell you about that hole-in-one.

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Rochester 12, N. Y.

ROCKFORD, NO. 12
First Thursday *
Earnest Y. Seborg, *Chairman*
1523 Huffman Blvd.,
Rockford, Ill.

ST. LOUIS, NO. 17
First Thursday *
Edward H. Ruder, *Chairman*
57 Hanley Downs,
Richmond Heights 17, Mo.

SAN DIEGO, NO. 44
Second Tuesday *
Raymond W. Peters, *Chairman*
6952 Fitch Ct.
San Diego 11, Calif.

SCHENECTADY, NO. 20
Second Thursday *
John Stedman, *Chairman*
54 Broderick St.
Albany 5, N. Y.

SEATTLE, NO. 39
Second Tuesday *
Gordon Munro, *Chairman*
Rt. 4, Box 2432
Bremerton, Wash.

SOUTH BEND, NO. 30
Second Tuesday *
Edgar W. Helm, *Chairman*
1152 E. Victoria St.,
South Bend 14, Ind.

SPRINGFIELD (ILLINOIS), NO. 64
First Tuesday *
Henry G. Becker, *Chairman*
830 No. 5th St.,
Springfield, Ill.

SPRINGFIELD (MASS.), NO. 32
Second Monday *
Alexander W. Todd, *Chairman*
50 Johnson St.,
Springfield 8, Mass.

SPRINGFIELD (OHIO), NO. 76
First Monday *
James B. Douglas, *Chairman*
609 E. McCreight,
Springfield, Ohio

SYRACUSE, NO. 19
Second Tuesday *
Hugo C. Klix, *Chairman*
425 Glenwood Ave.,
Syracuse 7, N. Y.

TOLEDO, NO. 9
Second Wednesday *
Albert Hage, *Chairman*
3700 Roanoke Rd.,
Toledo 12, Ohio

TORONTO, NO. 26
First Wednesday *
L. M. Jardine, *Chairman*
6 Pepler Ave., Toronto, Ont.

TRI CITIES, NO. 23
First Wednesday*
Lennart N. Dahlen, *Chairman*
901 43rd St.
Rock Island, Ill.

TWIN CITIES, NO. 11
Second Tuesday*
Clifford V. Lofdahl, *Chairman*
5933 Elliott Ave. S.,
Minneapolis 7, Minn.

TWIN STATES, NO. 40
Second Wednesday *
Alan E. Stubbs, *Chairman*
Highland Rd., Springfield, Vt.

WESTERN MICHIGAN, NO. 38
Second Monday *
Peter C. Maghielse, *Chairman*
2434 Miller Ave., N. W.
Grand Rapids 4, Mich.

WICHITA, NO. 52
Second Wednesday *
Harold J. Bales, *Chairman*
1702 N. Lorraine Ave.,
Wichita 6, Kan.

WILLIAMSPORT, NO. 49
Second Monday *
Lewis H. Bardo, *Chairman*
2347 Hillside Ave.,
Williamsport, Penn.

WINDSOR, NO. 55
Second Monday *
R. T. Richards, *Chairman*
R.R. No. 1, Windsor, Ont.

WORCESTER, NO. 25
First Tuesday *
Charles W. Monigle, *Chairman*
364 Greenwood St., R.F.D. 2,
Millbury, Mass.

* CHAPTER MEETING NIGHT

Inflation-Curbing Production, Turning Point in World Peace

Curtis Tells A.S.T.E.-A.F.A. at Chicago Machine Tool Congress

WHETHER WE succeed in limiting inflation by producing more for less, so that the standard of living can be increased in proportion to incomes, will be the measure of our victory or defeat in bringing order out of the chaos resulting from armed conflict. It will determine whether or not we will win the commercial battle in which we are now engaged and will be the turning point toward or away from another world war.

More than 350 members of ASTE, and the American Foundrymen's Association and visitors to the Machine Tool Show heard Myron S. Curtis, Asst. Director of Engineering, The Warner & Swasey Co., Cleveland, Ohio, drive home this point during an address before a joint dinner meeting of the two organizations in Chicago.

The technical session, held September 19 in Hotel Sherman, was one of a series sponsored by the Machine Tool Congress and presented concurrently with the mammoth Machine Tool Show in the Dodge-Chicago Plant.

Only Two Alternatives

Mr. Curtis, stressing the necessity of creating new wealth to replace that destroyed by war, said: "As far as I know, there are only two ways to increase production. They are either to increase the productivity of the individual by having him work harder and produce more per hour as a result of his direct labor, or to provide him with tools of increased productivity, so that, with the same amount of work, he will produce more goods."

Admitting that there seems little prospect of increasing wealth in the former instance, he pointed out: "We have for years, in the name of humanitarianism, been pampering the unfit, the unintelligent, and even the criminal, until the urge to produce, to create, which was so strong in our pioneer fathers, and which made this country what it is today, is fast disappearing.

"You can hardly blame a young man of today for trying to get by with as little work as he can, for not having initiative, for not saving, when all during his life a paternalistic government has been telling him that he doesn't need to be industrious, he doesn't need to plan, he doesn't need to save, because a benevolent government will take care of his future for him.

Better Tools, Better Living

"Perhaps even if we could, we would not want to increase our production by manual labor. Let Russia do that. The American way has always been to create more wealth, and provide a better standard of living for its workers, by providing more, better, and more efficient tools than other nations have."

Developing the technical phase of his subject, "'Turning' Points in the Metalworking Industry," Mr. Curtis asserted that swifter material handling and less perfection in finishes of metal parts are two means of getting more production out of machine tools. He described handling time as the periods required to load and unload the work, to change speeds and to bring the tools into position to perform the cutting operation.

By way of example, Mr. Curtis stated that his company had been able to increase the productivity of its new ram type turret lathes by 30% or more through application of electrical controls to automatically perform the manual operations.

In conclusion, Mr. Curtis reminded his audience that developments and improvements in machine tools are valuable only as they increase the efficiency of production; that the most ingenious and beautiful design is worthless if it does not add to productive capacity.

If machining time alone were continually decreased, the handling time would soon be so far out of proportion that any further decrease in machining time would result in only a slight improvement in production capacity, he added.

Fred J. Schmitt, Chairman of the Chicago ASTE Chapter, who presided at the meeting, then introduced T. E. Eagan, Chief Metallurgist for the Cooper-Bessemer Corp., Grove City, Pa., and Past Chairman, Grey Iron Div., AFA.

In discussing "When and How to Use Cast Iron," Mr. Eagan declared that the strength of cast iron depends on the distribution of the graphite which is controlled by the rate of cooling. Cast irons with tensile strengths up to 100,000 lbs. psi, heat treated grey iron with a yield point of 90,000 lbs. psi, and cast steel with a yield point of 60,000 lbs. psi have been produced, the group learned.

Other points stressed included: the greater notch fatigue strength of cast iron; that grey iron is strongest in torsion impact; parts subjected to excessive wear may be flame hardened; and that the vibration dampening properties of cast iron make it particularly adaptable to machine tool frames.

The proper use of cast iron can best be achieved by cooperation between the designer and foundry, Mr. Eagan concluded. His talk was well illustrated with slides on all the aspects discussed. Both speakers conducted open discussions after their lectures.

Officers Present

Prominent guests introduced by Mr. Schmitt included H. H. Pease, President of the National Machine Tool Builders Association; S. C. Massari, Technical Director of AFA; F. B. Skeates, Chairman, Chicago Chapter, AFA; W. B. Peirce, President; Ray H. Morris, C. V. Briner and A. M. Sargent, Past Presidents; I. F. Holland, First Vice-President; C. B. Cole, Director; and H. E. Conrad, Executive Secretary at the Detroit office, all of ASTE.

Tool engineers from all over America and from overseas get together at ASTE-AFA technical session of Machine Tool Congress during Machine Tool Show at Chicago.

At right, Myron S. Curtis of The Warner & Swasey Co., addresses more than 350 members and friends of the two organizations, whose officers sit at speakers' table

25,000 Quality Members Society Goal for 1950

A well-organized program of steady growth toward a membership goal of 25,000 by the Annual Meeting of 1950 is outlined in a communication issued to Chapter Chairmen and Membership Chairmen by H. F. Volz, National Membership Chairman.

The plan, which stresses quality membership, includes surveys of local industries and their staff members qualified to join ASTE. Each Chapter member is requested to submit a list of desirable prospects in his company.

Both administrative executives and eligible engineering personnel will be given information concerning the Society, its purpose, aims and activities, and will be invited to attend a Chapter meeting.

Suggestions for successfully executing the program are included in Mr. Volz' release.

Tire Manufacture Shown In Top Production Plant

Detroit, Mich.—A tour of the local plant of the United States Rubber Company plant was scheduled in place of the regular meeting of Detroit Chapter, October 9.

Dinner was served in the plant cafeteria to nearly 300 members. Later the group, in small parties of 15, was escorted through the tire processing plant. All departments were in complete operation, permitting the engineers to see each step necessary to produce automobile, truck, aircraft and farm implement tires.

The Detroit plant produces 35,000 tires daily, more than any other single factory in the world, W. P. Conway, Manager of the Mold Division, told the visitors during an address of welcome emphasizing the practical application of scientific developments.

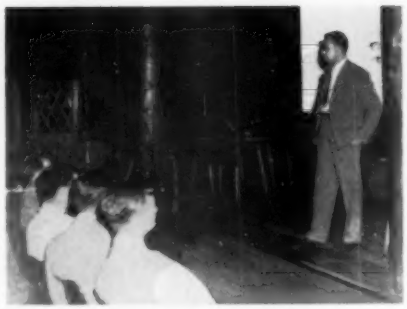
After observing plant operations for approximately two hours, with company guides furnishing very complete information, the members left with a better understanding and more knowledge of the tire making industry.

Peterson Writing Manual For Data Sheet Promotion

Toledo, Ohio—R. C. Peterson, Owner of Peterson Engineering Co. here, has been appointed to the ASTE National Standards Committee, W. H. Smila, Standards Chairman, has announced.

In commenting on the appointment, Mr. Smila stated that Mr. Peterson is well qualified, being a past Chairman of Toledo Chapter Standards Committee and long active in the field of standardization.

One of his first assignments is the preparation of a manual, "How to Tool a Data Sheet," intended as a help for Chapter Standards Chairmen. The manual will include a typical interview with a prospective data sheet supplier, giving in question and answer form full information concerning the Society's data sheet program.



John Floden of Rockford, Ill., winner of Boston Chapter's M.I.T. scholarship, gives resume of his $100 thesis at Rockford Chapter meeting where award was presented

Boston Chapter Award Presented at Rockford

Rockford, Ill. — The $100 annual scholarship offered by Boston Chapter, ASTE, to the Massachusetts Institute of Technology student submitting the best thesis on a tool engineering subject, has been awarded to John Floden of Rockford.

At the request of Boston Chapter, the prize was presented by E. Y. Seborg, Rockford Chapter Chairman, during the first Chapter dinner meeting of the fall season, held September 11 in the new YMCA Lodge.

As coffee speaker, Mr. Floden gave an abstract of the prize-winning paper, "Effects of Cutting Fluids on Drilling Thrust and Torque," written while attending M.I.T. in Cambirdge, Mass.

The principal address of the evening was delivered by R. F. Waindle, General Manager, Sapphire Div., Elgin National Watch Co., Aurora, Ill. Mr. Waindle lectured on "Sapphire—An Engineering Material."

The importance synthetic sapphire is assuming industrially, such as in gages and indicator wear points, was stressed.

His talk was accompanied by a sound-color film showing the steps required to change an artificial sapphire "boule" to a finished watch bearing.

Among guests at the meeting was John Finlay of Sidney, Australia, one of the three ASTE'ers in that country.

A member of the staff of Gilbert & Lodge Co., importers of machine tools, Mr. Finlay is visiting several machine tool companies in the United States, studying the servicing of their machines.

Right at home in this assembly line environment, Detroit Chapter members are dinner guests of U. S. Rubber Co., prior to evening tour of the large Detroit tire factory

Trade Invited to Exhibit At Cleveland Exposition

Detroit, Mich.—Exhibit space application forms, floor plans and full information concerning the ASTE Tool Engineer's Industrial Exposition at Cleveland Public Auditorium, March 15-19, have been mailed to former and prospective participants, according to C. V. Briner, Exposition Committee Chairman.

Trade publication advertising announcing the big production equipment show also has been released to begin with November insertions.

The number of advance applications received from former exhibitors indicates heavy demand for space in the Society's next biennial Exposition.

Companies interested in showing their products or services to the thousands of ASTE members and other industrial buyers who will visit the 1948 Exposition may secure details from the Tool Engineer's Industrial Exposition Committee, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

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Coordination Keynote of Fall Regional Conferences

Mid-west Chapter officers and national officials of the Society gathered at Hotel Morrison, Chicago, September 21, for a regional conference.

The meeting was called by Director C. B. Cole of Chicago, at the request of President W. B. Peirce, to more fully acquaint Chapter officers and committee chairmen with the Constitution and By-Laws, and Procedures of the Society as they apply to Chapter operation and to bring Chapters into closer contact with the national organization.

After explaining the purposes of the meeting, Mr. Cole introduced President Peirce. A membership of 25,000 within the next two or three years is the Society's goal, Mr. Peirce stressed. In referring to the necessity for a permanent Central Office, he announced his appointment of Past President A. M. Sargent to locate suitable quarters and of Ray H. Morris, another Past President, to head a committee to suggest ways and means of financing such a project.

Handbook Nearing Completion

Handbook work, the President reported, is being completed and every effort will be made to have copies of the manual available at the Cleveland show.

George C. Johnson, Third Vice-President, spoke briefiy, outlining details of the membership campaign.

Pointing out that the Procedures are supplementary instructions issued as a guide to the interpretation of the Constitution and By-Laws, J. J. Demuth, National Constitution and By-Laws Chairman, offered his assistance on problems in this department.

Otto W. Winter, National Education Chairman, related the steps being taken to establish tool engineering as a recognized profession among educators and professional groups.

The standardization and data sheet programs which the National Standards Committee has under way were summarized by G. S. Wilcox, Jr., National Director and Standards Committeeman. Mr. Wilcox presented two other members of the Committee, L. B. Bellamy, Detroit Chapter Chairman, and William Moreland, Second Vice-Chairman of the Chapter, who supplemented his remarks.

Chairmen Report for Chapters

All Chapter Chairmen attending the meeting were called upon by Mr. Cole to present Chapter problems and suggestions. The executives, speaking on behalf of their home groups, included: E. Y. Seborg, Rockford; F. H. Kessenich, Madison; W. P. Clark, Racine; E. W. Mellin, Fort Wayne; L. N. Dahlen, Tri-Cities; P. E. Butzin, Milwaukee; E. H. Ruder, St. Louis; E. W. Helm, South Bend; P. H. Magnus, Pittsburgh; R. A. Hruska, Cedar Rapids; and F. J. Schmitt, Chicago.

All of the Chairmen reported their efforts in striving for a greater Society while confronted with operational problems concerning cost of dinners, programs, printing expenses, attendance, differential between dinner charges for members and visitors, and upgrading of members. The various difficulties were discussed or taken under advisement.

The necessity for better organization of Chapter Editorial Committees was emphasized by W. B. McClellan, Chairman of the National Editorial Committee. Suggestions as to the proper selection and operation of Committee personnel were also given.

In this connection, H. E. Conrad, Executive Secretary, explained the handling of Editorial and Program Committee data for publication in *The Tool Engineer*.

National Committee Chairmen, said First Vice-President I. F. Holland, should be advised of coming Chapter Executive Committee meetings to enable them to attend such meetings wherever possible. He invited the membership to present any complaints or criticism to the national organization, for consideration.

Activities of the National Program Committee, its aims, purposes and plans for the future, affecting individual Chapters as well as national conventions, were described by Fred J. Schmitt, Second Vice-Chairman of the Committee. He appealed for more complete, prompt and factual reports on speakers, for addition to the file at the Central Office.

Urges Financial Prudence

H. R. Nelson of the National Finance Committee, promised serious consideration of all budget requests, but cautioned against undue expenditures.

Mr. Hruska commented on the high cost of the jewelled Past Chairman pins, and C. J. Hasse, Office Manager at the Detroit headquarters, announced that a new type of pin had been secured for approval at the Boston convention. Mr. Hasse also presented a Society map, ready for distribution to Chapter Chairmen, showing locations of Chapters and key officers in the organization.

Another member of the Detroit office staff, J. M. Cannon, Public Relations Director, was introduced and spoke of his work in connection with publicity.

Others among the 53 present at the meeting were: A. M. Schmit, retiring Director, Toledo; C. V. Briner, Cleveland, and H. L. Tigges, Toledo, Directors-Elect; A. R. Gieringer, National Constitution and By-Laws Committee, Milwaukee; R. W. Bayless, National Education Committee and Peoria Chapter Secretary; R. H. Morris, Building Fund Chairman, Hartford; E. A. Doogan and W. G. Ehrhardt, Past Chairmen, and E. P. Huchzermeier, Secretary, St. Louis Chapter.

L. A. Leifer, First Vice-Chairman, E. L. Westbury, Program Committee, and V. J. McFair, Madison Chapter; H. M. Taylor, First Vice-Chairman, R. F. Erickson, Secretary, F. M. Kincaid, Treasurer, T. C. Barber, Membership Chairman, and E. W. Freeman, Chicago Chapter; R. A. Radtke, Editorial Chairman, Milwaukee Chapter; W. Z. Fidler, Past Chairman, Tri-Cities Chapter.

R. C. W. Peters, Treasurer, Toledo Chapter; Andrew Carnegie, First Vice-Chairman, M. O. Cox, Secretary, R. D. Seeley, Treasurer, G. F. Bush, Education Chairman, and O. B. Harvey, Chairman of Plant Representatives, Detroit Chapter; A. F. Schroeder, Past Chairman, Fond du Lac Chapter; Howard Nelson, First Vice-Chairman and R. A. Lindblom, Program Chairman, Rockford Chapter; and J. F. Davis, Public Relations Chairman, Fort Wayne Chapter.

H. R. Nelson served as secretary of the meeting.

* * *

A similar meeting of Middle Atlantic Chapters was held September 16 in the Bellevue-Stratford Hotel, Philadelphia, and conducted by Director T. J. Donovan, Jr., of Philadelphia, and Executive Secretary Conrad.

A revision of the Chapter allocation of Affiliate and Associate member dues was thoroughly discussed, along with a proposal that Chapters have the incentive of a financial remuneration for securing new members.

M. J. Radecki of the National Editorial Committee invited suggestions for improving *The Tool Engineer* and urged Chapters to be more alert in handling Editorial Committee assignments.

A number of Chapter representatives expressed a desire for extra copies of *The Tool Engineer* for distribution to prospective members. Mr. Donovan suggested that members who do not file their magazines might mail them with a membership application blank to desirable prospects.

P. A. Rickrode of the National Constitution and By-Laws Committee called attention to several points in the laws governing the Society, and Mr. Conrad explained a proposed standard meeting notice to be furnished all Chapters for imprinting.

Chapters Need More Income

In a discussion of Delegates' traveling expenses, the general consensus of opinion was that the national organization permit the Chapters to secure more revenue to meet the cost of sponsoring a representative in the House of Delegates.

Chapter officers and members present at the meeting were: T. F. Burke, Chairman, G. A. Exley, First Vice-Chairman, and H. G. Suiter, Constitution and By-Laws Chairman, Baltimore Chapter; J. R. Langworthy, Constitution and By-Laws Chairman, Northern New Jersey Chapter; A. R. Diamond, Chairman, S. R. Boyer, First Vice-Chairman, Emil Kitzman, Second Vice-Chairman, and H. W. Gross, Constitution and By-Laws Chairman, Philadelphia Chapter. Mr. Boyer acted as secretary of the meeting.

P. P. Stock, Chairman, S. E. Sheffer, First Vice-Chairman, P. F. Leese, Treasurer, and E. Evans, Central Pennslyvania Chapter; E. J. Novack, First Vice-Chairman; H. S. Hunt, Chairman, and G. Roth, Membership Chairman, Greater New York Chapter; R. T. Plitt, Past Chairman, Potomac Chapter; L. H. Bardo, Chairman, and D. M. Lowery, First Vice-Chairman, Williamsport Chapter.

Past Chairmen's Night Inaugurates New Season

San Francisco, Calif.—Past Chairmen of Golden Gate Chapter were honored at the opening meeting of the season, held September 16 at Oakland.

Former Chapter leaders, who were called to the floor and related significant events in the growth of the organization from its inception in 1940 to its present membership of more than 250, were Carl Horack, Karl L. Bues, Louis Talamini and Edward J. Raves.

Two other Past Chairmen, Harold Wolpman and Walter Kassebohm, and incumbent Chairman Floyd Snodgrass were unavoidably absent, attending the Machine Tool Show in Chicago. First Vice-Chairman E. C. Holden presided.

Technical speaker was A. M. Ondreyco, Plant Manager of Vulcan Foundry in Oakland, whose address, "Application, Properties and Manufacture of Cast Iron," was illustrated with slides.

Describes Composition of Irons

Mr. Ondreyco outlined means whereby highly specialized irons could be prepared to exhibit outstanding resistance to heat, corrosion and wear. Structural requirement for a high grade iron with consistently good engineering properties, he said, is a dense pearlitic matrix with finely divided graphite homogeneously dispersed.

Applications and manufacture of Meehanite were compared with ordinary gray cast iron, which yields tensile strengths of from 25,000 to 30,000 psi, but has physical properties difficult to control to product uniformly strong castings.

With the addition of calcium silicate to disperse the graphite in the iron, and control of the melting process and temperatures to insure a pearlitic matrix, Meehanite foundries, Mr. Ondreyco claimed, can turn out heat after heat in a range of from 40,000 to 50,000 psi.

Good Foundry Practice Essential

Cupola furnace controls for high tensile strength consist in maintaining the proper proportions of air, coke and iron as these materials are added to the furnace. Good foundry practice in the selection and conditioning of sand and the proper design of gates and risers are the final criteria for producing a satisfactory casting from such improved irons, he added.

Applications include such critical parts as tool holders, milling heads, stamping and forming dies, as well as volume production parts where high strength and wear resistance are sought. Ductility of cast irons is generally poor, said Mr. Ondreyco. However, he demonstrated a spring cast in Meehanite with every appearance of comparing favorably with many alloy products.

Mr. Ondreyco closed his discussion with helpful considerations in design to insure good castings. The staggering of rib structures, provision of an odd number of spokes in cast wheels, plenty of radius on corners and the avoidance of thin core sections were among points made for the designer.

New Design Course Added to Canadian Curriculum

Toronto, Ont.—A course in Production Tool Design has been introduced in the curriculum of evening classes offered by Toronto Chapter, under the direction of John W. Lengbridge, Education Chairman.

Jig, fixture and gage design, cutting tools, production lathe and screw machine operations are included in the subjects being studied in the new course.

Classes in Punch and Die Design for Pressed Metal Operations, successfully conducted for several years, are being continued. Students in this course are taught theory and practice of press cutting and press drawing operations, diameter reduction, blank calculation, lubrication, miscellaneous press operations, and estimating and analyzing of costs and methods.

Mr. Lengbridge, Project Engineer at Aluminum Goods, Ltd., and Louis Connoy, Mechanical Engineer for General Steel Wares, Ltd., are the instructors.

On the faculty of the Production Tool Design course are: Harvey Collison, Partner, Collison-Goll Engineering Co.; Ivor Toby, Chief Tool Designer, Screw Machine Products, Canadian Acme Screw & Gear; William Camm, Designer, Canada Cycle & Motor Co., Ltd.; Harold Storey, Chief Draftsman, A. C. Wickman Co.; Michael Hollo, Designer, and Andrew Smith, Asst. Chief Draftsman, Aluminum Goods, Ltd.

After each lecture, there is an open discussion period. Basic data is dictated, data sheets are supplied, and production samples are used for illustration wherever possible.

The Production Tool Design class meets Tuesday evenings and the Punch and Die Design group Thursdays, in the Conference Room of Aluminum Goods, Ltd., enabling members and others interested to take both courses if desired.

Begun during the early war years at the request of the War Emergency Board, the Chapter teaching program has been continued and expanded by popular demand.

Fond du Lac and Madison members visit Giddings & Lewis Machine Tool Co. prior to joint meeting. G. S. Wilcox, Jr. (left behind sign), ASTE Director, was guest speaker, explaining "Functions of the Tool Engineer"

Advances in Gear Making Add Strength, Cut Costs

Toledo, Ohio—Roy McDermott, General Superintendent of Spicer Mfg. Corp., Div. of Dana Corp., told Toledo Chapter members of "Some Manufacturing Methods and Problems of Heavy Duty Transmission Gears" at a meeting October 8 in the Toledo Yacht Club.

Mr. McDermott drew upon his 25 years' experience in design and manufacture of automotive gears in discussing present methods of gear making and some of the advancements and improvements of the past few years.

Close control of billet composition and correct forging design are very important, the speaker stated, in obtaining maximum and uniform strength in finished gears. Another forward step, he added, is improved heat treating, eliminating quenching dies.

Among the many guests present were S. C. Bjornberg, Chief Consulting Engineer, Illinois Tool Works, Chicago; Ben Bregi, Executive Engineer, National Broach and Machine Co.; Charles Staub, Chief Engineer, and Paul Zerkle, Sales Manager, Michigan Tool Co., all of Detroit. These visitors also contributed much valuable information to the discussion following Mr. McDermott's address.

Wisconsin Groups Join In Inter-City Meeting

Fond du Lac, Wis.—Afternoon tours of Giddings & Lewis Machine Tool Co., Fond du Lac, and the Wisconsin Axle Div. of the Timken-Detroit Axle Co., Oshkosh, preceded the September 12 joint meeting of Fond du Lac and Madison Chapters.

More than 100 members and guests studied the production of boring machines and boring tools, axles and automatic oil burners in the two plants.

After dinner at the Athearn Hotel, Oshkosh, 139 engineers heard ASTE Director Grant S. Wilcox, Jr., Asst. Master Mechanic at Plymouth Div. of Chrysler Corp., Detroit, explain "Functions of the Tool Engineer."

Contour Turning Highlight of Lathe Discussion

Rochester, N.Y. — Stanley Brandenburg, Sales Manager of Monarch Machine Tool Co., was the featured speaker at the opening meeting of Rochester Chapter, held September 4 at Doud Post Home.

Mr. Brandenburg's talk, "Monarch Lathes," was amply illustrated with both slides and films. Motion pictures of the Monarch Shapemaster in action aroused much interest and comment among the members. After showing the film, the speaker answered questions.

A color film of the Chapter's annual picnics since 1939 afforded considerable amusement.

James Horne of the National Program Committee gave a resume of the Boston Semi-Annual Meeting program, and George Codd, Membership Chairman, welcomed new members to the Chapter. Since the first of the year, 63 new members have been added to the roll towards a membership goal of 400.

R. B. Barnett, Program Chairman, outlined a season program of interesting lectures to be presented by recognized engineers in their respective fields. The subjects were selected by a Chapter survey.

After the meeting a buffet lunch was served.

* * *

On the previous Saturday, the Chapter committee chairmen and directors drove out to Conesus Lake for their annual clambake, at the summer home of Cecil Lucas, a former Chapter Chairman.

Wet weather in the morning gave way to clearing skies before noon, providing a beautiful day for the outdoor event.

Jake Phillippsen as "chef" treated the officers to his delicacy, fried chicken. After dinner, the group relaxed in chairs on the shore and watched the sailboat races.

A short business meeting was held in preparation for the opening of the fall season.

What is a true gift? One for which nothing is expected in return.

—Confucius.

Flint Chapter entertains Society visitors from Detroit at dinner meeting in Frankenmuth, Mich. From left: G. S. Wilcox, Jr., Director; H. T. Pierpont, Jr., Chapter 1st Vice-Chairman; H. E. Conrad, Executive Secretary; C. J. Hudson and J. Fox, speakers; C. J. Haase, Office Mgr., ASTE; and C. L. Fanning, Chapter Education Chairman

Unique Grain Structure Feature of New Abrasive

Flint, Mich.—"Grinding Wheels and Other Abrasives" was the subject of a recent Flint Chapter technical session held at Fischer's Hotel in Frankenmuth.

Charles J. Hudson, Quality Manager of Norton Co., Worcester, Mass., explained and demonstrated, to one hundred members and guests, materials and methods used in manufacturing abrasives.

The first grinding wheels, Mr. Hudson recalled, were made of an abrasive known as Turkish emery, containing about 55% of aluminum oxide. The other components were a clay bond and pores.

A little later, he continued, emery from the Island of Naxos, with an alumina content as high as 64%, made a superior grinding wheel. Various abrasives were subsequently used in grinding wheels, including natural corundums from Massachusetts, Georgia, North Carolina and Canada.

In 1900, said Mr. Hudson, about the time of the discovery in India of a rather pure corundum running as high as 90% alumina, a Mr. Jacobs obtained a patent describing the electrical fusing of bauxite.

In the meantime, research was continued for new and better abrasives, resulting in development of a 99% pure crystalline aluminum oxide.

Recently, according to the speaker, an entirely new type of abrasive has been discovered, having a purity of about 99% crystalline aluminum oxide. An added characteristic of the new abrasive is that each grain is an individual, complete crystal with many cutting points.

Mr. Hudson then demonstrated samples of various materials and finished products. A lively question and answer period followed his talk.

Coffee speaker for the evening was J. Fox of the Veteran Motor Car Club of America, who showed films of the old car parade at the automobile Diamond Jubilee in Detroit last year.

Detroit guests at the meeting included G. S. Wilcox, Jr., National Director; H. E. Conrad, Executive Secretary, and C. J. Hasse, Office Manager, from the Central Office. The visitors spoke briefly, explaining Society activities.

Situations Wanted

MANUFACTURING EXECUTIVE — Tool Engineer, 43, with 22 years' experience in engineering and plant administration, stamping and machine products, line production and jobbing, cost reduction, methods, progressive tooling, product development, plant layout and coordination, and industrial relations. Can assume full responsibility of plant and engineering. Available immediately as plant or works manager or executive engineer. Married; will locate anywhere. Address Box 129, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

MANUFACTURING EXECUTIVE (Machinery) — Capable administrator with 28 years' background in special machinery—design, manufacturing and sales. Age 44. Formerly vice-president and general manager of machine tool manufacturing company. Address Box 130, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

MASTER MECHANIC—25 years' experience in automotive, aviation and motor industries. Capable of supervising large staff, handling plant layout, purchasing, methods, tooling, processing, inspection, time study, labor relations. Served apprenticeship with English naval construction and engineering company. M. E. diploma from technical college. Married; prefer Michigan location. Full details on request. Please address reply to Box 131, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

PLANT MANAGER, 37—Other experience includes positions as chief engineer for automatic machine builder, master mechanic for aircraft engine company, chief tool engineer for major hydraulic pump manufacturer, and industrial engineer for machine tool and textile machine builder. Have excellent cost reduction record. Graduate engineer, served machinist apprenticeship. Please reply to Box 131, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

PRODUCTION MANAGER, 47—With 29 years of diversified experience in all phases of machine shop work, production scheduling, time study, tooling and tool design, which includes 10 years of supervision and management. Mechanical engineering graduate. Desires responsible position with future. Married. Willing to relocate. Will arrange interview at convenience of those interested. References. Please address reply to Box 125, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

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Tool Engineer Exhibit ASTE Rendezvous at Tool Show

Chicago, Ill.—Hundreds of Society members attending the recent Machine Tool Show here found *The Tool Engineer* exhibit a pleasant place to meet and greet friends, and rest their calloused feet between relays in the marathon of tramping miles of machine tool displays.

The visitors were welcomed by James Hartnett, Western Advertising Manager of *The Tool Engineer*'s Chicago office; Robert B. Powers, Executive Editor; Clarence Etter, Advertising Manager; and James Curran, Production Manager.

Nearly 500 of those who stopped at the booth registered in the official guest book. Of these 332 represented 63 Chapters and the At Large group; 91 were guests and unidentified members; while 46 were too weary to write their names legibly.

They are as follows: Akron Chapter—L. W. Neff and F. A. Hobbs; Atlanta—C. W. White and E. F. Nash; At Large—Dr. H. Orenstein, Glasgow, Scotland; W. E. Sjostedt, Sodertalje, Sweden; D. G. Lewis, Los Angeles; and F. W. Wilson, Detroit.

Baltimore—G. F. Steiner; Boston—T. B. Walsh, I. E. Getchell, L. S. Gates, R. W. McTear, G. W. Sauter, and R. J. Wlodkowski; Buffalo-Niagara Frontier—R. F. Kipers, G. R. Hine and W. T. Cole; Cedar Rapids—A. H. Goodyear, E. G. Stephenson, R. E. Bextine and E. H. Wheeler.

Chicago—H. R. Nelson, W. M. Greaves, A. S. Rakestraw, J. C. Schmidt, J. H. Zales, V. R. Beatty, S. H. Cyganek, W. H. Traver, J. J. Kayda, Frank Martindell, R. S. Eggers, C. Arnold Ritter, A. J. Schwister, M. A. Romano, L. E. Ording, D. L. Owen, W. L. Bengtson, Steve Motrychuk, A. A. Soest, R. F. Erickson, I. A. Hecht, C. M. Huss, C. B. Cole, G. J. Berns, R. C. Graham, Marvin Wortell, E. C. McLean and O. J. Onken.

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Cincinnati—C. J. Solsman; J. A. Elsbernd, B. J. Wood, J. L. Myers, W. J. Frederick, R. H. Heidenreich, Lorin Hayden, Henry Bruewer, J. H. Quatkemeyer, Fred Hirsch, L. J. Leewe and C. J. Schonhoft; Cleveland—R. C. Southwell, J. E. Hathaway, J. X. Klym, V. B. Kurczyk, J. C. Cross, Edward Heller, Karl Eberhardt, H. E. Roush, F. C. Nimberger, Joseph Bednar and A. D. Proctor.

Columbus—C. R. Youmans and H. F. Volz; Dayton—J. W. Lee, P. C. Snyder and T. M. Fischer; Decatur—H. C. Vogt and W. S. Thompson.

Detroit—M. E. Wiljanen, Paul Hacker, W. H. Smila, G. H. Rumford, A. M. Sargent, A. F. Denham, W. B. McClellan, A. G. Nancarrow, L. H. Kuehn, Otto Hoelzel, R. J. Lannen, E. A. Slowik, A. H. Typinski, Stanley Gondek, A. J. Mittig, W. B. Shaw, F. J. Fauser, J. A. Litch, F. G. Dickson, G. S. Wilcox, Jr., L. B. Bellamy, O. E. Harvey, Andrew Carnegie, H. A. Bachman, L. L. Linzell.

H. J. Knight, E. W. Zill, O. E. Lubnau, J. A. Siegel, C. L. Hause, K. B. Spaulding, J. A. Leroy, Alex Donaldson, F. C. Hebert, Harry Gordon, C. F. Weckesser, J. W. Bennett, G. L. Carpenter, Elmer Szaute, Jack Durran and William Himelson.

Elmira—R. G. Williams and J. R. Lynch; Erie—F. E. Smith; Fairfield County—R. M. Burgess, C. T. Moehring and Andrew Kudola, Jr.; Flint—C. L. Fanning; Fond du Lac—H. S. Faith; Fort Wayne—G. G. Hahn, E. T. O'Keefe, C. F. Clausen, R. F. Hansing, J. P. Denham and C. F. Harbeck.

Fox River Valley—R. G. Frogness and T. L. Kings; Golden Gate—I. S. Minetti; Hamilton—W. S. Werthmiller, H. C. Johnson, W. A. Dawson and W. A. Patterson; Hartford—H. E. Kuryla, L. C. Lambert, C. J. Siegel and C. A. Hoaglund; Houston—Homer Briggs, G. E. Allen, W. L. Mason, W. C. Landry, L. F. Chickering and W. A. Shortal.

Indianapolis—A. M. Love, S. B. Harvey, A. A. Trefz, F. D. Wood and E. W. Hilkenbach; Kansas City—F. H. Erhard, W. H. Lebo and F. R. Deal, Jr.; Little Rhody—Frank Pfister; Los Angeles—E. A. Schigut; Louisville—K. C. Jasper; Madison—E. E. Riddle, F. H. Kessenich and Larry Leifer.

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Mid-Hudson — E. W. Garrison; Milwaukee—H. L. Heywood, H. E. Rathlesberger, W. O. Behrend, F. L. Brugger, G. J. Maurice, A. T. Femrite, C. H. Lovendahl, R. J. Buettner, A. G. Ott, R. C. Sickinger, C. H. Paulick, D. D. Eyster and A. E. Thompson, Jr.; Montreal—G. S. Clarke, G. M. Foster, H. C. Spencer and W. F. Stewart.

Nashville—H. D. Frueauff, Jr.; New Haven—F. A. Shute, C. A. Chipman, J. A. Benson and J. H. Alton; New Orleans—C. N. Hazlewood; New York, Greater—W. J. Sherry, B. M. Knoll, V. H. Laughner, S. J. Wotzak, S. P. Hall, C. V. Pellier, H. S. Hunt and W. J. Hargest (London, Eng.)

Niagara District — Henry Hendriks and H. J. Jeffers; Northern New Jersey—H. E. Dietrich, H. T. Pokorny, J. S. Ball, A. J. Epprecht, R. F. Green, C. L. Thomson, A. J. McNamara, H. E. Linsley and Eric Preece; North Texas—J. A. Lapham; Peoria—W. H. Jensen, J. F. Reich, J. O. Burise, C. H. Schafer, J. O. Knight, V. W. Joslin, E. J. Clancy, B. G. Trunk and Ray Zimmerman.

Philadelphia—N. S. Gable, F. L. Creager, J. A. McMonagle and G. W. Powell; Pittsburgh—W. B. Peirce, J. H. Thomas, R. W. Shenefelt, J. R. Shields, Joseph Smith, John Morris, P. M. McKenna, H. C. Dicome, A. J. Whitehill, W. W. Walter and W. H. Schott; Portland, Me.—V. A. Burnham and C. L. Bohlin; Potomac—R. P. Thayer, Harry Springer and R. R. Maltpress.

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Racine—E. L. Dreyer, N. N. Sorenson, H. E. Coshun, W. A. Swan, Eugene Bouton, J. G. Obermeyer and C. J. Schweitzer; Richmond—George Young, P. A. Becker, C. D. Taylor, P. C. Perrine, P. C. Hermansdorfer, H. E. Fleming and Carl Van Ausdall; Rochester—B. A. Zeller and F. B. Neary.

Rockford—W. R. Lustig, L. A. Johnson, W. H. Peterson, E. W. Dickett, G. O. Brown, W. W. Blomberg, C. I. Hampton and R. R. Hamilton; San Diego—W. R. Moliere; South Bend—E. W. Wallis, J. R. Mason, P. N. Oedekirk, J. E. Spotts, W. L. Veatch, A. V. Rixan and George Bretz.

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Springfield, Ill.—H. C. Chambers; Springfield, Mass.—G. E. O'Keefe, F. W. Curtis and K. F. Kuralt; St. Louis—K. T. Sawyer, R. D. Hibbs, R. R. Hodges, K. F. Wermke, E. F. Sager, A. L. Pretz, F. A. DeBello, C. H. Lott, J. Zurfehr; R. L. Pohlman, H. R. Hanen, M. P. McDonnell, J. E. Bashforth, A. F. Loo, Frank Bock and B. A. Fleury, Jr.

Syracuse—H. C. Klix and K. J. Koenen; Toledo—S. W. Burgess, O. R. Fandry, L. G. Rogers, A. M. Schmit, R. C. Peterson, C. E. Robitaille, Albert Hage, Frank Hahnlen, Jr., L. S. Stump, W. L. Ulrich, D. J. Laessle, M. G. Schultz and E. Jones.

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Toronto—L. F. Knight, R. E. Crawford and L. G. Singer; Tri-Cities—J. K. Pirmann, W. W. Hudson, N. B. Long and L. R. Johnston; Twin City—W. E. Huffman and W. W. Quist; Twin States—L. M. Cleveland; Western Michigan—E. J. Roossien, T. S. Vanderveen and Grant Beilfuss.

Windsor—A. R. Davidson, A. E. Carley, F. J. Cowell, J. N. Paddison, Jack Willett and A. B. Pettit; Worcester—C. W. Monigle, E. T. Harper, E. T. Larson, R. Van Keuren, T. C. Bradford, C. R. Swanson, Alvar Swanson and A. L. Larson.

* * *

Guests and Unidentified Members—Calif., San Francisco, W. B. Moore; Conn., Hartford, C. A. Peterson; Norwalk, G. A. Frechette; Stratford, O. A. Olsen; Ill.—Arlington Heights, P. J. Vollman: Batavia, G. P. Vance; Bloomington, R. S. Koch; Brookfield, Frank Matiasik; Chicago, Sheldon Booth, Paul Raffles, Joseph Cavanaugh, C. C. Robertson, R. J. Hornewer, Richard Gaik, A. R. Kirby, J. W. McCue, C. G. Malquest, George Hendry, Alex Malysko, Jr., and J. Bilka.

Des Plaines, V. Olson; Evanston, R. P. Dearlove; Stickney, William Franklin; Rock Island, C. E. Swanson; Rockford, H. W. White; Elmhurst, George Cartright; Cicero, Charles Leff; Peoria, P. W. Steimle and L. F. Clancy.

Ind., Indianapolis, Young Moore; South Bend, J. C. Yoder and B. Walinski; Warsaw, A. J. Heinzelman; Iowa, Cedar Rapids, R. O. Baker and R. R. Caldwell; Newton, LeRoy Veenstra.

Mich., Detroit, R. H. Oberholtzer, Gunnar Karlstrom, S. A. Mathews, C. E. Rogers, E. H. Pioch, C. Wisner, H. E. Conrad, E. Brezma, H. C. Stever, J. W. DeClaire, Edward Stanwix, H. W. Hamley, B. W. Firestone, H. K. Edlund, and K. Mercik, Jr.; Saginaw, O. J. Goodrich.

Minn., Minneapolis, E. P. Leide; Mo., St. Louis, W. C. Chapman and E. J. White; Neb., Milford, C. R. Waddle; N. J., Newark, A. J. Seelba; Roselle Park, Otto Hocherhaus; Trenton, Edward Gazsi.

N. Y., Buffalo, G. R. Hine; Milton, C. R. Purdy; New York City, A. J. Dur-

An Ever-Growing ASTE Serves America's Expanding Industry

Society membership and geographical concentration keeps pace with industry's advances into new manufacturing areas and development of established ones. During the past year four Chapters were chartered at Poughkeepsie, N. Y.; Madison, Wis.; Springfield, Ohio; and Denver, Col., swelling the number to 76, in 29 states and two provinces

ASTE CHAPTER CITIES AND NUMBERS

1 Detroit
2 Racine
3 Cleveland
4 Milwaukee
5 Chicago
6 (Bridgeport) Fairfield Cty.
7 Hartford
8 Pittsburgh
9 Toledo
10 Buffalo—Niagara Frontier
11 (Minneapolis-St. Paul) Twin City
12 Rockford
13 Baltimore
14 (Newark) Northern New Jersey
15 Philadelphia
16 Rochester
17 St. Louis
18 Dayton
19 Syracuse
20 Schenectady
21 Cincinnati
22 (York) Central Pa.
23 (Moline, Rock Island, Ill., Davenport, Ia.) Tri Cities
24 Elmira
25 Worcester
26 Toronto
27 Los Angeles
28 (San Francisco) Golden Gate
29 Houston
30 South Bend
31 Peoria
32 Springfield (Mass.)
33 Boston
34 Greater New York
35 Binghamton
36 Columbus
37 Indianapolis
38 (Grand Rapids) Western Michigan
39 Seattle
40 (Springfield, Vt.) Twin States
41 New Haven
42 Hamilton (Ont.)
43 Nashville
44 San Diego
45 Fond du Lac
46 Portland (Me.)
47 Akron
48 (Washington, D. C.) Potomac
49 Williamsport
50 Montreal
51 (Dallas) North Texas
52 Wichita
53 (Providence) Little Rhody
54 Louisville
55 Windsor, Ont.
56 Fort Wayne
57 Kansas City
58 Decatur
60 New Orleans
61 Atlanta
62 Erie
63 Portland (Ore.)
64 Springfield (Ill.)
65 (St. Catharines, Ont.) Niagara District
66 Richmond
67 Phoenix
68 Flint
69 Pontiac
70 Muncie
71 Cedar Rapids
72 (St. Charles, Ill.) Fox River Valley
73 Evansville
74 (Poughkeepsie) Mid-Hudson
75 Madison
76 Springfield (Ohio)
77 Denver

TOOL ENGINEER EXHIBIT

(Concluded from Page 56)

ante; Poughkeepsie, E. G. Burger; Ohio, Canton, D. W. Doll; Cincinnati, H. P. Meier, F. P. Gradolf, R. L. Owens and F. Jansen; Cleveland, D. S. Oliver; Dayton, R. E. Allen, E. C. Argue and E. J. Kimm; Toledo, C. F. Walfert, Wauseon, H. G. Rupp; Yellow Springs, William Schaub; Okla., Blackwell, John Fisher.

Penna., McKees Rocks, D. W. Moore; Philadelphia, G. A. Daum; Robertstown, C. W. Fisher; Youngwood, J. P. Farrell; Texas, Fort Worth, C. L. Richhart; Houston, C. E. Ladner.

Wis., Madison, L. J. Henry; Milwaukee, E. J. Ungemoch, L. Ruzzenberger and Jack Marvin; Racine, W. H. Haas; Hartford, K. R. Pike.

Foreign—Turkey, Istanbul, M. Greenberg; Czechoslovakia, Praha, Josef Pic; China, Shanghai, K. L. H. Bao; Holland, Gelbury, J. Monig.

Shaving of Motor Rotors Described in Gear Talk

St. Louis, Mo.—"Modern Gear-Finishing," an exceptionally interesting lecture by B. F. Bregi, Executive Engineer of National Broach & Machine Co., featured the first fall meeting of St. Louis Chapter, held September 4 in the De Soto Hotel.

Long active in the design, development, production and engineering of precision gears, Mr. Bregi ably explained these phases, including the processing and inspection of external and internal gears, with particular emphasis on finishing of tooth profiles after shaping or hobbing. New applications of the shaving principle to the finishing of electric motor rotors were also discussed.

Pictures and a display of samples supplemented the talk. Mr. Bregi's answers to the subsequent questions from the assembly were comprehensive.

FILM FLASHES

Index of Training Films, Second Edition—A revised and enlarged listing of more than 2000 industrial training films has been prepared by the editors of *Business Screen* magazine.

In the metalworking field are motion pictures and slide films concerning Foundry and Forging, Hydraulics, Welding, Machine Shop, Materials and Metals, Sheet Metal, Production Methods, Electronics, and Engineering.

Among other industries represented in the classified index are Aviation, Automotive, Ceramics and Glass, Chemical, Petroleum, and Plastics.

Loan sources are also included in the 128-page book. Copies of the index are available from the Motion Picture Film Dept., Eastman Kodak Co., Rochester 4, N.Y.

* * *

Special Steels—A series of seven motion pictures, dramatically presenting details of special steel production, use and fabrication, is offered by a steel manufacturer.

Titles are: "Manufacture of Dies," "Arc Welding Stainless Steel," "Corrosion," "Exploring with the Micro-Timer," "Steel for the Ages," "Stainless Steel," and "Melting" (of high carbon, high chromium tool steel).

In addition to their educational value, the films are entertaining in their utilization of various photographic devices such as a camera operated at 5000 frames per second in filming the machining of stainless steel, and natural color scenes of molten steel in an electric furnace at temperatures up to 2850°F.

Descriptive literature and bookings may be obtained from C. B. Templeton, Manager, Sales Promotion, Allegheny Ludlum Steel Corp., 532 Oliver Bldg., Pittsburgh 22, Pa., or from local company representatives.

Peirce Visits Fort Wayne

Fort Wayne, Ind.—W. B. Peirce, Society President, was a speaker at a meeting of Fort Wayne Chapter held October 8 in the Chamber of Commerce Building.

Mr. Peirce explained the functions and activities of ASTE National Committees and discussed the Society's first Handbook which is rapidly nearing completion. Chapter members expressed the opinion that the Handbook should be made available to bona fide students at a reduced rate.

Norman H. Iverson of Michigan Broach Co., Detroit, technical speaker of the evening, gave a very enlightening talk on the subject of broaching, pointed out the economies to be gained by using this process. He illustrated his talk with blackboard sketches and motion pictures.

Included among the approximately 75 men attending the meeting were seven Junior Members, students at Tri-State College, Angola.

We Want Pictures of More Chapter Meetings

Clock Hobbyist Builds Community Timepiece

Bradford, Pa.—Albert J. Whitehill, Tool Engineer at the Dresser Mfg. Div., Dresser Industries, whose hobby is clocks, often vowed to build one from the "ground up."

But he never expected his opportunity to present itself in an assignment to construct a timepiece replacing one

Albert J. Whitehill is about to place last part in 350-pound town clock which he constructed for Butler, Penna., as leisure time hobby project

weighing more than two and one-half tons!

When the town clock at Butler, Pa., fell prey to the infirmities of old age, ASTE'er Whitehill, its custodian, was commissioned to build a successor.

In true tool engineering tradition, he simplified the design of the new clock so that the entire movement weighs only 350 pounds, complete with weights and pendulum, as compared to its 5400-pound prototype.

"The upright shaft," explains Engineer Whitehill, "goes to the shaft leading to the hands on the 10′ 6″ dial. The bell that strikes the hour weighs nearly three tons and can be heard five miles on a clear day."

The new clock keeps split second time and will cost only 64c a month to operate, he adds.

Nearly 14 months of spare time went into its design and construction, but the results attained and the satisfaction experienced in the fulfillment of his ambition are well worth the effort, the Pittsburgh Chapter member feels.

Metal Window Tooling Described in Detail

Atlanta, Ga.—Members of Atlanta Chapter heard James C. Cogburn, Jr., describe "Tooling for the Production of Aluminum Windows," as the technical feature of their September meeting in the auditorium of the Atlantic Steel Co. Mr. Cogburn, Window Dept. Foreman for Williams Bros., is immediate Past Chapter Chairman and heads the Education Committee.

His talk, embracing the entire process of manufacturing aluminum window sash, stressed the problems of developing a suitable product and of obtaining adequate production. Many of the tools, dies, and special machine tools used were detailed, as well as production processes and operations.

During the lecture, samples and subassemblies were exhibited.

A short film, picturing the new Man-Au-Trol Spacer was shown through the courtesy of Chandler Machinery Co. and the Bullard Co.

Rossmann States T.E.'s Position in Management

Baltimore, Md.—An outstanding address on "Management" was delivered to Baltimore members by Peter F. Rossmann of the Propeller Div., Curtiss-Wright Corp., principal speaker at a Chapter dinner meeting October 1 in the Engineers Club.

Mr. Rossmann, who spoke without notes or manuscript, gave a comprehensive picture of the tool engineer's place in the management of manufacturing plants under present conditions. He is a member of Northern New Jersey Chapter, ASTE.

A Government sound film, "Tale of Two Cities," showed the effects of the atomic bombing of Hiroshima and Nagasaki.

W. Lee Elgin, Commissioner of Motor Vehicles, was the coffee speaker.

Process Engineer's Place In Industry Analyzed

Detroit, Mich.—More than over 300 members and guests of Detroit Chapter turned out for dinner and to hear James Jones, Master Mechanic, Hudson Motor Car Co., deliver an informative address, September 11, at the opening meeting of the season. His topic was "The Process Engineer's Place in Industry."

In presenting his views, Mr. Jones aroused much curiosity, as later evidenced by the many inquiries during the question and answer period. Here again Mr. Jones displayed a sharp mind and quick thinking with tactful and completely satisfying replies. Earlier in the evening, technical sound films in color, showing the mining of high grade iron ore, were presented.

Is Your News Report In?
Nov. 10 is the deadline
For the December Issue

PROGRAM *personalities*

A phase of metalworking often overlooked by ASTE Chapters in their study of modern production methods is currently being presented by Walter R. Buerckel, Factory Representative of Nicholson File Co., Providence, R. I.

Mr. Buerckel, in a lecture on "Manufacture, Metallurgy and Application of Files," reviews the early history and old and new methods of manufacturing files. He describes steels used, their heat treatment, processing such as the cutting of file teeth and finishing of cut files, application of regular and special purpose files, and the manufacture of rotary files and burrs.

O. H. Somers

W. R. Buerckel

Uses and abuses are contrasted and file terminology interpreted. After the lecture Mr. Buerckel displays many types of files and demonstrates those of special interest. He uses slides to illustrate his address.

In his eight years' association with Nicholson, Mr. Buerckel has become thoroughly familiar with every phase of the manufacture and use of all types of hand files and power driven rotary files.

Widely experienced in lecturing, he devotes his entire time to technical discussions before engineering, industry supervisory and apprentice groups.

His services are available to most ASTE Chapters in the United States, except in the Far West, South and Southwest.

* * *

A new lecture service, available to Middle West and North Atlantic ASTE Chapters, as well as to industry generally, is announced by the Standard Gage Co., Inc., Poughkeepsie, N. Y. Primarily of an educational nature, the program includes a compact display of the principal dimensional measuring instruments currently available and suitable for production process control. Their effective use is discussed by the lecturer.

The presentation, professional rather than commercial in nature, covers the selection and application of suitable gaging techniques for both the usual fabrication and inspection purposes and for statistical quality control. Considerable emphasis is placed on cost reduction as a result of adequate gage usage.

The lecturer is O. H. Somers whose background includes four years at Massachusetts Institute of Technology, nine years of development, sales and production engineering in the chemical, telephone and gage industries, and five years in the Army as a production engineer on tanks and other combat vehicles.

He completed his military duty as a Lt. Col., Ordnance Dept., and was awarded the Army Commendation Ribbon for his engineering services. In addition to his ASTE membership in Mid-Hudson Chapter, he is affiliated with SAE and is a Founding Member of the American Society for Quality Control.

Annual Awards Presented To Drafting Students

Elmira, N. Y.—Awards for outstanding work in the field of mechanical drawing during the 1946-1947 school term were presented to Jerome P. Clark of Corning Free Academy and Fred D. Bowen of Ithaca Senior High School during Elmira Chapter's first meeting of the season, held September 8 at the Mark Twain Hotel.

Student Clark won a set of drafting instruments and young Bowen was given a series of ASTE tool design textbooks. The awards were the first of an annual Chapter presentation.

After dinner and the award presentation, George J. Schad, Metallurgist of Carpenter Steel Co., Reading, Pa., discussed "Tool Steels."

Mr. Schad traced the history and development of modern tool steels from pre-Civil War days; pointed out the advantages and disadvantages of oil, water, and air hardening steels; and stressed the need for good design, careful heat treatment and proper grades of steel as the most important factors in overcoming tool failures. A number of lantern slides supplemented his very informative talk.

Two motion pictures were shown, "New York State, the Vacation Empire," a travel film; and "Pay Loads Pay Off," an exposition of modern methods of material handling presented by the Automatic Transportation Co. of Chicago. E. L. Bertram, Buffalo representative of the company, led a question and answer period after the showing.

Chairman Edward Stachel presided over the meeting of about 50 members and guests and introduced the speakers.

Mason Now Vice-President

Kansas City, Mo.,—Walden W. Mason, Works Manager of Gleaner Harvester Corp., Independence, has been made a vice-president of the company, according to a recent announcement.

Mr. Mason, who was instrumental in the organization of Kansas City Chapter, ASTE, was its first Chairman and has since served as Public Relations Chairman. He is a member of ASM, Vice-President of the Associated Metal Industries of Kansas City, and a registered professional engineer in the State of Missouri.

High Temperature Metals Refined to Powder Form

South Bend., Ind.—Allan L. Percy, Director of Public Relations for Fansteel Metallurgical Corp., Chicago, Ill., presented a film, "The Refractory Metals," as the technical feature of the September 9 meeting of South Bend Chapter, held in the Indiana Club.

The film depicted the refining and processing of tungsten, tantalum, titanium and columbium, high temperature metals difficult to melt which are refined to powder by physical and chemical purification.

The powder, the motion pictures showed, is then compressed, sintered and forged into the final ingot. From the ingot, the material is worked hot through rolls or drawing dies to develop the metal for commercial use. Such metals find extensive use as electrical contact, chemical resistant material and for repairing damaged bones and joints in the human body.

Tungsten, in particular, and the other metals to a lesser degree have been used extensively with carbon to form the sintered carbides for high production cutting tools.

Following the film lecture, a panel discussion was conducted by Mr. Percy, ably assisted by Herbert B. Clark and Harry W. Highriter, General Manager and Technical Director, respectively, of Vascoloy-Ramet Corp.

The panel discussion brought out several interesting points, such as: faults of diamond grinding wheels; use of induction heating for fastening carbide tips; difficulties of interrupted cuts; and inadequacy of many drilling machines to provide speed and rigidity for tungsten carbide tools.

A technicolor film, "Highway to Alaska," from Allis-Chalmers Mfg. Co., completed the program.

Gauge and Tool Makers Plan Visit to America

London, England—A party of about 20 members of The Gauge and Tool Makers' Association plans to visit the United States next March, primarily for the purpose of attending the ASTE Tool Engineer's Industrial Exposition and Annual Meeting at Cleveland Public Auditorium, March 15-19.

The group expects to visit gage and tool factories in several cities before returning to England. Their proposed itinerary follows: March 5, sail from Southampton via *Queen Mary;* March 10, arrive New York, stay at Hotel Commodore; March 12, day at Hartford, Conn.; March 14, leave New York; March 15, arrive Cleveland, stay at Hotel Statler.

March 17, leave Cleveland; March 18, arrive Cincinnati, stay at Hotel Gibson; March 19, leave Cincinnati; March 20, arrive Chicago, stay at Hotel Bismarck; March 22, leave Chicago, arrive Detroit, stay at Book-Cadillac Hotel; March 24, leave Detroit, arrive and leave Niagara Falls; March 25, arrive New York; March 27, sail for England.

Coming MEETINGS

CLEVELAND—November 14, East Side Turners. Speaker: Gordon Volkenant, Asso. Director of Research, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Subject: "Gadgets, Gimmicks and Electronics." December 6, Christmas party, Hotel Allerton. March 15-19, ASTE Tool Engineer's Industrial Exposition and 16th Annual Meeting, Cleveland Public Auditorium.

DETROIT—November 13, Engineering Society of Detroit. Speaker: Dr. Clarence A. Siebert, University of Mich., who will discuss the growing importance of corect material specifications in tool engineering and explain recent technological advances. November 20. Speaker: Prof. O. W, Boston, University of Mich., Subject: "Machining of Metals."

December 4, Invitational Round Table, Technical Chairman, W. H. Smila. Subject: "Developments in Standard and Special Machine Tool Designs." Participants: Ralph Cross, The Cross Co.; John Lovely, Chief Engineer, Jones & Lamson Co.; Benjamin Bregi, Executive Engineer, National Broach Co.; Herbert Tigges, Vice-Pres., Baker Bros.; and Phillip Hewett, Cincinnati Milling Machine Co. December 11, Christmas Party.

FLINT—November 20. Subject: "Latest Developments in Turning Machines," sponsored by Monarch Machine Tool Co., Sidney, Ohio. December 11, Ladies Night.

HARTFORD—December 1. Subject: "Precision Boring." Speaker from The Heald Machine Co., Worcester, Mass.

MILWAUKEE—November 13, Elks Club. Speaker: J. T. Welch, Sheffield Corp., Dayton, Ohio. Subject: "Crush Grinding," illustrated with slides. December 11, Plant Visitation to Allen-Bradley Co. Dinner, meeting, sports films, cards and refreshments.

TOLEDO—November 12, 7:00 P.M., Toledo Yacht Club. Speaker: P. M. McKenna, Pres., Kennametal, Inc., Latrobe, Pa. Subject: "Carbide Tools and Appliances." December 10. Speaker from Seal-Peal, Inc., Detroit, Mich.

TORONTO—December 3. Subject: "Current Trends in Hardness Testing."

TWIN STATES—November 12, Springfield, Vt. Speaker: R. E. Small, head of Aircraft Gas Turbine Div., General Electric Co., West Lynn, Mass. Subject: "Aircraft Gas Turbines."

Tool Show Impressions Related by Geschelin

Rockford, Ill.—"A Trip Through the Machine Tool Show" was brought to Rockford members by Joseph Geschelin, Detroit editor of several automotive publications, who was the principal speaker at a dinner meeting, October 2, in Hotel Faust.

The meeting, sponsored jointly by the Chapter and the Rockford Junior Chamber of Commerce, was attended by approximately 225 members and guests of the two organizations.

Mr. Geschelin related his own views and interpretations of the importance to the automotive industry of machines exhibited at the recent Chicago show.

Emphasizing that the theme of the show was "Cost Reduction," he cited examples of remarkably improved speeds and feeds of machine tools displayed.

The speaker stressed the cleanness of design and the nicety of mechanical perfection observed in most machine designs. He paid particular attention to the "transfer" type of machine, now generally accepted by the automotive industry as a means to reduce costs and improve production.

Extremely accurate work, Mr. Geschelin commented, can be produced on many of the machines now available.

Among out-of-town guests present at this meeting were Mr. Helman from Sweden, Mr. Ottolow of New York, and others from Chicago, Beloit, Madison and Genoa.

E. W. Dickett, first Chairman of the Chapter, presented a Past Chairman pin to D. E. Hawkinson.

Welding Award Offered Undergraduate Students

Cleveland, Ohio—Details of the 1948 Annual Engineering Undergraduate Award and Scholarship Program, sponsored by the James F. Lincoln Arc Welding Foundation, are described in a 24-page brochure recently issued by the Foundation.

Undergraduate students in all branches of engineering are eligible to participate in the competition for papers concerning designs for arc welding of parts of machines, complete machines, trusses, girders, or structural parts.

Manuscripts may also deal with the maintenance and repair through arc welding of existing machines, machine parts, structures, or structural parts in industry or in agriculture.

Seventy-seven individual cash prizes, ranging from $1000 to $25, are offered under the award plan. In addition, the institutions in which the three top winners are students will receive amounts equal to these awards, to be administered as scholarships in the names of the award winners. The contest closes May 15, 1948.

Rules and conditions, suggested fields for applications, illustrations of typical subjects, and a bibliography of publications relating to welding and its applications are included in the award booklet.

Copies are available to anyone interested, upon application to the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

Machineability Lecture Opens Autumn Program

Fort Wayne, Ind.—C. J. Oxford, Chief Engineer of the National Twist Drill & Tool Co., Rochester, Mich., was the technical speaker at a meeting of Fort Wayne Chapter, September 10, in the Chamber of Commerce Building. Mr. Oxford's subject was "Machineability and Problems of Production."

Prior to the technical address, B. B. Whittier of the U. S. Weather Bureau discussed weather and meteorological forecasting.

Approximately 55 members and guests attended the first dinner meeting of the fall season.

Cleveland Members Learn About Aircraft Gas Turbines

Unseasonal heat failed to deter Cleveland members from turning out September 12 for opening fall meeting. In foreground are, from left: J. A. Fitzsimmons, Entertainment Chm.; George Trundle, coffee speaker; E. W. Baumgardner, Chapter Chm.; and R. E. Small of General Electric Co., who spoke on "Aircraft Gas Turbines"

H. A. Messner of the Tocco organization demonstrates fluxing and induction brazing of a specimen assembly to Los Angeles Chapter members during a technical session

Modern Brazing Alloys Improve Ancient Process

Los Angeles, Calif.—While silver brazing has been done for thousands of years, it has now become a production process through the development of modern brazing alloys, some 27 of which are used industrially, Los Angeles members learned during a talk by John Lafferty, engineer for Handy & Harman.

Mr. Lafferty was assisted by John B. Ross in presenting his subject, "Silver Brazing Alloys for Production Use," at the September 11 Chapter meeting.

Outstanding features of silver soldering, said Mr. Lafferty, are the low brazing temperature, great joint strength, speed of the process, and the finished appearance of the joint.

Preparation of the parts to be joined, he cautioned, is of major importance. They must be perfectly clean, fit with from .001 to .003 clearance, and be fluxed.

Versatility a Feature

Many methods of heating may be used, he added, such as air and gas, oxy-acetylene, induction or resistance heating; and like as well as dissimilar metals may be joined.

The correct amount of solder is applied by assembling the parts to be brazed with pieces of foil, ribbon or wire rings made of the brazing alloy. When the assembly reaches the melting point of this alloy, capillary attraction causes it to flow between the members and make a joint much stronger than the brazing alloy itself, the speaker concluded.

A motion picture of various methods of silver soldering was shown, followed by a presentation of representative samples.

Harlan A. Messner of the Tocco staff demonstrated an induction heating unit in actual operation.

In the absence of Chairman Leslie F. Hawes, in Detroit to attend a meeting of the ASTE Cleveland show committee, First Vice-Chairman R. Gerald Stronks conducted the meeting.

Hans Bamberger, Education and Training Chairman, described the new ASTE design textbooks.

Electronics Made Easy In Film, Demonstration

St. Catharines, Ont.—"Electronics at Work" was described and demonstrated by W. G. Clarkson, Industrial Electronics Engineer at Canadian Westinghouse Co., Hamilton, before some 60 members of Niagara District Chapter, meeting October 2 in the Queensway Hotel.

Mr. Clarkson outlined the story of the electron or flow of current from its source to the stage where it may be handled for commercial use.

The speaker accompanied his address with slides showing in simplified manner the electron's appearance in tubes and what it does. He explained the six major uses of electrons: rectifying, amplifying, generating, controlling, converting heat to light and converting light to heat.

Mr. Clarkson presented a fine, sound motion picture, "Electronics at Work," depicting commercial uses. Concluding his program, he gave a simplified demonstration of various applications of electrons such as the control of current by photo-electric cell and thermotrons.

Chairman W. L. Sandham provided an interesting after-dinner film on Trans-Canada Airlines.

New Auto Described

Milwaukee, Wis.—A capacity crowd turned out to hear Dr. Kenneth E. Lyman, Technical Advisor to Preston Tucker, President of the Tucker Co., Chicago, describe "Highlights of the Tucker Automobile" at a meeting of Milwaukee Chapter, September 11, in the Elks Club.

In addition to the outstanding features of the Tucker car, details of its design and construction were discussed by Dr. Lyman who has supervised its engineering.

The many questions asked from the floor at the conclusion of his address indicated high interest in the subject. Many of the members had inspected an actual Tucker model displayed during the week in Milwaukee Auditorium.

A color motion picture of a 3000-mile trip through Wisconsin was shown by K. E. Vaillancourt, Asst. Curator of the Milwaukee Museum.

Claims Overhead Handling Unlimited in Adaptability

Montreal, Que.—"Limitations of overhead handling are the limitations of imagination," A. S. Wrobleski, Asst. Sales Manager of The American Monorail Co., Cleveland, Ohio, told Montreal members while discussing "Overhead Handling Equipment" as guest speaker at the Chapter's September 10 meeting in the Windsor Hotel.

Mr. Wrobleski's statement was partly substantiated by some of the applications shown in the sound film, "Up and Over," which illustrated the lecture.

Describing the advantages of overhead handling, the speaker emphasized the saving in time, labor and space possible with this method as compared to floor level handling equipment, requiring wide aisles and considerable space for maneuvering.

An interesting application shown in the film was the installation of a Monorail system in a hospital, where it was used to lift paralytic patients from their beds or stretchers, move them to a treatment pool, and lower them gently and safely into the water to the required degree of immersion.

Operates by Remote Control

Highlight of the motion picture was the use of electronic remote control, now in the experimental stage, where an operator controls the movements of an overhead crane by holding a wand, one end of which is attached to a small control box. The box shown contained six buttons, two each for vertical, horizontal and lateral movements.

Rays transmitted from the end of the wand, never closer than 20 feet from the crane, were picked up by controls on the crane, actuating the mechanism regulating the various movements.

Mr. Wrobleski told how employees were at first confused and startled to see an overhead crane perform apparently of its own volition.

The use of rubber drive wheels on motorized Monorail installations eliminates wear between tracks and drive-wheels, the speaker explained, in answer to a question from one of the members.

"Precision and Skill," a sound film describing the accuracy and proficiency demanded in the manufacture of Greenlee automatic screw machines, was shown during the coffee period. The sequences depicted the various stages of assembly of the Greenlee machines, and demonstrated the almost unlimited series of machining operations capable of being performed automatically, to a high degree of accuracy, on this equipment.

Eighty-three members and guests attended the opening meeting of the 1947-48 season.

M.T.T.A. Announces Show

London, England—The Machine Tool Trades Association announces an International Exhibition at Olympia, London, late in August, 1948.

The exhibition will be the first of its kind in London since the Association's show in 1934.

Schmit Awarded Plaque

President W. B. Peirce (right) presents a merit award plaque to retiring Director A. M. Schmit on behalf of Toledo Chapter, as Albert Hage, Chapter Chairman, watches. (Award story appeared in October ASTE News.)

Ball Bearing Production Demands High Precision

St. Catharines, Ont.—The development and achievements of the Canadian ball bearing industry were discussed by Ivan L. Kaye, Superintendent of the McKinnon Industries Anti-Friction Ball Bearing Division, before 90 Niagara District members and guests attending a meeting September 10 in the Queensway Hotel. Mr. Kaye prefaced his technical talk with an outline of the circumstances of McKinnon's entry into the ball bearing field, claiming that this is the only manufacturer so engaged in Canada.

After a brief history of the origin of ball bearings, the speaker stressed the three absolute requirements for competitive production: (1) accuracy limiting tolerance for out of round on balls to 25 millionths; (2) straight line production permitting forgings machined in the morning to be shipped as boxed bearings in the afternoon; and (3) use of carbide tools to an extreme degree to attain top production.

A series of interesting slides illustrated the address, concluded with a sound film, "Quality in the Making."

Mr. Kaye congratulated the Chapter and individual members on their interest in all tool engineering topics, declaring that they have a major contribution to make in the future of mass production in Canada.

A demonstration of a ball bouncing machine was observed with keen interest. A motion picture of the 1941 Soap Box Derby completed the program.

Glass Textiles Featured In Ladies Night Program

Kansas City, Mo.—Approximately 40 couples attended Kansas City Chapter's first annual Ladies Night, observed September 3 as the fall season opening event.

Program for the evening was presented by the Owens-Corning Fiberglas Corp., whose representatives, Mr. Baker and Mr. Coombs, showed the housewives many interesting household articles such as lamp shades, draperies and upholstery, in addition to slides depicting the manufacture of fiberglas and its products.

Funlight of the evening was Joseph Grant, magician extraordinary, as "Dr." Grant, representing the "East Indian Herb Co. of Ceylon."

Tool Engineer's Know-How Termed 'Proudest Export'

The proficiency of tool engineers and other technical experts is the subject of an article, "Our Proudest Export," recently published by *Business Week* and subsequently issued in condensed form by *Reader's Digest*.

American technical knowledge, the article states, nearly always accompanies exports of materials and equipment; brings in about $500,000,000 a year; and should be a factor in reorders for American products, spare parts, replacements and equipment to expand foreign projects.

This export commodity consists of the sale of blueprints and economic and engineering surveys; licensing of patents and processes; shipment of packaged plants and machines; training of foreign technicians in American plants and universities, as well as the loan of private and Government technicians.

Most of this technical assistance goes to countries which are becoming industrialized, such as the more advanced Latin American nations. But much Yankee skill is also sent to modernize and repair Europe's devastated industries.

Hundreds of large foreign industrial plants, the editors declare, are designed built, shipped, constructed and initially supervised by American engineering firms and manufacturers.

Ranging in value from a few thousands of dollars to many millions, the enterprises are almost infinite in variety, according to the story which quotes a number of outstanding examples.

Patnaude Shows Swaging In Motion Pictures

Providence, R.I.—A highly instructive film lecture on Swaging was presented to Little Rhody Chapter members by Frank Patnaude of the Standard Machinery Co. at a meeting September 10 in Oates Tavern.

At the close of the film, Mr. Patnaude answered numerous questions from the audience.

Mr. Pryor of the Rhode Island State College Extension Division reported preparations at his school for the course in machine tool engineering and design being offered this semester, an undertaking in which the Chapter Education Committee has assisted.

The meeting was advanced a week to avoid conflict with the Chicago Machine Tool Show.

Obituaries—

Joseph L. Trecker

Stricken with a heart attack, Joseph L. Trecker, 46, President of Kearney & Trecker Corp., Milwaukee, Wis., died in his office, October 7.

Mr. Trecker was born at West Allis, Wis., and educated in the local schools. He was also graduated from Iowa State College.

His entire business life was spent with Kearney & Trecker whom he joined as an engineering detailer. Through successive posts as sales engineer, secretary and treasurer, vice-president and executive vice-president, he rose to the presidency of the company.

A member of Milwaukee Chapter, ASTE, he was also affiliated with the American Gear Manufacturers Association and ASME and was a past president of the National Machine Tool Builders Association.

During the war he was particularly active in the organization of subcontracting.

* * *

Joseph F. Ahearn

Joseph F. Ahearn, 62, President and General Manager of the Universal Instrument & Metal Co., Inc., Binghamton, N. Y., succumbed to a lingering illness, August 31, at his home in Binghamton.

Mr. Ahearn was born and educated in Susquehanna, Pa., where he served a machinist apprenticeship in the Erie Railroad shops.

He was later employed in the tool and die business in other cities before joining the firm which he headed at the time of his death.

A charter member of Binghamton Chapter, ASTE, he was also affiliated with the Knights of Columbus, Fourth Degree; ASME, the National Tool and Die Makers Association and the Binghamton Chamber of Commerce.

ASTE members and associates at International Business Machines Corp. who paid their respects to Mr. Ahearn are: Arthur Becker, Roger Coles, James Cahill, Dean Erlenmeyer, Ralph Fowler, Wendell Harper, William Holland, Louis Keller, Ronald Brewer, Morris Craver, Lester Wenn, Herbert Peck, Louis Brown, Frank LeBaron, Harold Brigode, Fred Rief, Albert Kramer, Robert Collett, Joseph Purdy, John Cuddy and Thomas Killelea.

* * *

Willard A. Erickson

Willard A. Erickson, 59, widely known in the metal working industry throughout Massachusetts, Connecticut, New York and Pennsylvania, died of pneumonia in Newark, N. J., August 23.

A native of Worcester, Mass., Mr. Erickson joined The Heald Machine Co. there in 1907. At the time of his death he was Asst. Manager of the New York office, a post he had held for many years.

He was a member of Northern New Jersey Chapter, ASTE; Morning Star Lodge, A.F. & A.M., Worcester; Valley of Newark Temple, A.A. Scottish Rite, and Salaam Temple, A.A.O.N.M.S., Newark; and Maplewood and Essex County Country Clubs.

BULLETINS AND TRADE LITERATURE

Items briefed herein have been carefully selected for their interest and application. Unless otherwise stated, all are available, free, from the stated sources.

NORTON COMPANY, Worcester 6, Mass., offers *Norton Products for the Pulp and Paper Industry*, a 48-page manual describing not only the Norton products used but "how" they are used. A 36-page pocket manual, also available at this time, is *A Handbook on Thread Grinding*.

The new 80-page Catalog 25962, by **EX-CELL-O CORP'N**, 1200 Oakman Blvd., Detroit 6, Mich., lists the many *Ex-Cell-O Precision Grinding Spindles*, spindle brackets, and quills, with full information on their application to grinders new and old.

The **NEW YORK JOURNAL OF COMMERCE**, 63 Park Row, New York 15, N. Y., is offering at 50¢ per copy a booklet on *How to Sell to the Government*, designed to take the mystery out of bidding and contract procedures.

How to Tell Your Company's Story, published by **RESEARCH INST. OF AMERICA**, 292 Madison Ave., New York 17, is designed to show businessmen how to effectively tell the business story to employees, stockholders, consumers, buyers, government, and the general public. It is assumed, naturally, that the organization has already developed and is practicing commendable policies. Many typical illustrations are drawn of businesses that have made strides in this field.

MERZ ENGINEERING CO., Indianapolis 7, Ind., has explained in a new 20-page booklet the exclusive "New-Matic" principle of air gage operation, featured in the new line of *Merz New-Matic Measuring Machines*.

SPERRY PRODUCTS, INC., 15th St. & Willow Ave., Hoboken, N. J., has issued Data Sheet 3700 on the *Sperry Reflectogage*, a precision instrument which measures thickness of parts up to 4", requiring access from one side only, and also is used to test for bond.

Part IV of the "Blueprint for Industry" series by **INDUSTRIAL OVENS, INC.**, 13825 Triskett Rd., Cleveland 11, Ohio, describes *Continuous Extrusion Takeup Equipment*, featuring new constant tension reel drive and an ingenious and efficient system of loading and unloading reels without interrupting the winding process.

BUR-ology, 34-page pocket manual introduced by **PRATT & WHITNEY**, Div'n Niles-Bement-Pond Co., West Hartford 1, Conn., is an educational story of how burs are made and used. *P & W Plain and Universal Die Sinkers*, Nos. 2B and 3B, is the subject of a 12-page bulletin. These machines feature oscillating head, universal operation, and full range of spindle speeds.

GREENLEE BROS. & CO., Rockford, Ill., has issued a bulletin on its *Automatic Transfer Processing Machines*, tracing their early development and describing several of the latest costs-saving machines. Another recent bulletin describes the *Lead-Screw Feed* available on Greenlee Automatics.

RAPIDS-STANDARD CO., INC., Rm. 342, AB-168 Peoples National Bank Bldg., Grand Rapids 2, Mich., has released a bulletin on its lightweight, portable, *Aluminum Rapid-Wheel Gravity Conveyor*.

The *1947-48 Bulletin* of the **DETROIT COLLEGE OF APPLIED SCIENCE**, 1200 W. Eight Mile Rd., Ferndale 20, Mich., includes general information about the college founded and directed by O. B. Jones, founder and honorary member of ASTE, and also describes the tool and production engineering curricula.

The **INDUSTRIAL DIAMOND INFORMATION BUREAU**, Industrial Distributors Ltd., St. Andrew's House, 32-34 Holburn Viaduct, London, E.C.1., England, publishes monthly a bulletin containing abstracts of articles dealing with properties and industrial applications of diamond, in addition to notices of patents and patent applications in various countries.

ALLEGHENY LUDLUM STEEL CORP'N, 2020 Oliver Bldg., Pittsburgh 22, is distributing a new 72-page listing of tool and high speed steel *Warehouse Stocks* which indicates available types, shapes, and sizes, and also shows the exact warehouse location of each item.

BALDWIN LOCOMOTIVE WORKS, Eddystone, Pa., in Bulletin 254 describes its line of standard and custom-built *Southwark Steam Platen Presses*, being used in the fabrication of belting, gaskets and packings, grinding wheels, linoleum, molded rubber goods, plastic laminates, and as many other diversified types of products.

The **B. B. CHEMICAL CO.**, 784 Memorial Drive, Cambridge, Mass., has released *Adhesive Facts*, 4-page bulletin on Bostik adhesives which bond practically any similar or dissimilar materials.

GENERAL ELECTRIC CO., Schenectady, N. Y., is distributing *Analysis of Measurements, Bull. GET-1344*, a comprehensive functional analysis and classification of measurement systems that employ electrical means; an outline of their historical development; and also applications to research and development, to compilation of data and statistics, and to coordination and standardization.

The 32-page *Second Edition of Catalog BL*, issued by **WALES-STRIPPIT CORP'N**, 345 Payne Ave., N. Tonawanda, N. Y., describes the Wales "BL" Hole Punching Units for multiple punching of holes up to 2" dia., in mild steel up to $\frac{1}{8}$" thick.

From the **SURFACE COMBUSTION CORP'N**, Toledo, Ohio, is available *Humidity Control*, an 8-page booklet describing the Kathabar System of Selective Humidity Control for industrial processing applications.

"DESIGN", a company of *Industrial Designers and Consultants*, 2707-09 S. Calhoun St., Fort Wayne 6, Ind., has issued a folder in which are presented an outline of services. The list of items which includes charges, is unusually complete and takes in practically the entire gamut of engineering services.

"Step Up Production", describing the 3M Backstand Method of grinding and finishing, is available from **MINNESOTA MINING & MANUFACTURING CO.**, St. Paul 6, Minn.

United States Patents on Powder Metallurgy, **NAT'L BUREAU OF STANDARDS** Publication MI84, is a comprehensive list of powder metallurgy patents, together with a short abstract on each. It is available at 30c per copy from the Sup't of Documents, Washington, D. C.

Grinding Wheels, issued by **GRINDING WHEELS MANUFACTURERS ASS'N**, 27 Elm St., Worcester 8, Mass., represents the fifth revision of the Nat'l Bureau of Standards' "Simplified Practice Recommendations." Contents include: standard shapes and dimensions with key symbols; the various type and size wheels available for specific operations; and recommendations for new machine designs, the universal acceptance of which will ultimately eliminate many of the now-too-numerous grinding wheel sizes.

Bulletin DS-118 gives complete information on the Type "B" Build-Up Terminal Block Kit, designed for experimental work and maintenance operations. Using this kit, from 1 to 14 terminals can be produced. The bulletin may be obtained from Terminal Sales Office, **CURTIS DEVELOPMENT & MFG. CO.**, 1 No. Crawford Ave., Chicago 24.

The complete line of Zagar special machinery and tools for industry—broaching machines, collets, fixtures, multi-spindle drilling and tapping heads—is covered in *Catalog TE-9*, announced by **ZAGAR TOOL, INC.**, 23880 Lakeland Blvd., Cleveland 17, Ohio

TOOLS OF TODAY

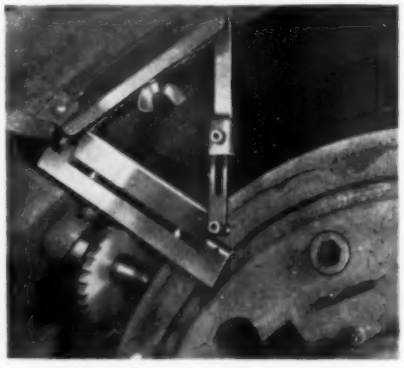
Air-Hydraulic Press

A new **AIR-HYDRAULIC PRESS**, for light forming, riveting, and assembling, by *Bryant Products Company*, Jackson, Michigan, is a simple compact unit featuring controlled pressure and ram speed. Ram speed can be varied from 1 to 40 strokes a minute with a fast return regardless of cycle speed.

Pressure is controlled by a valve in the supply line, and the unit is said to use only about 40% of the air required to operate an air cylinder of the same power. The base and housing are ruggedly built of cast iron and are carefully machined to prevent distortion. The power unit is mounted on four easily accessible bolts for easy removal, adjustment or repair. **T-11-1**

New Diamond Wheel Dresser

A new **DIAMOND WHEEL DRESSER**—the Diamond-Miser—by *Diamond-Detroit, Inc.*, Detroit, is designed to hold the diamond tool against the wheel in such a way as to produce a uniform rotation of the diamond and cause a new face to be presented to the wheel with each pass, making for cleaner and more uniform dressings. The rotation is said to overcome a common fault of conventional diamond tools—i.e., failure to rotate the tools. Thus, wheel dressing suffers and the tool becomes prematurely useless.



The uniform rotation of the new dresser is said to maintain the proper shape of the diamond so that flats cannot develop. The Diamond-Miser is available in three different models—the DMC 2, which automatically rotates diamond tool by means of a cog wheel and a trip; the DMN1, which provides for hand indexing in front; and the DMB51, which has indexing disc in rear. **T-11-2**

New Alloy Sprayer

The new Forrester **ALLOY SPRAYER**, by *K. & F. Metal Spray Industries*, Dept. 24, 11204 Charlevoix, Detroit 14, requires only plugging in the hose to air pressure line to operate. Air requirements are 3½ cubic ft. per minute at 30 to 40 lbs. pressure. Temperature control is adjustable from 100 to 600°F., and, it is claimed is maintained within $\frac{1}{10}$ of a degree.

The makers claim that almost any kind of low temperature metal can be handled, the alloy to be used being dropped into the pot, after which the cover is clamped down. Melting takes from 2 to 10 minutes, when spraying can be done by merely pressing a button on the handle. Coatings so thin—approximately .00001"—that fingerprint lines, grain in wood, and dot pattern in halftone engravings are easily distinguishable through the metal, while being sprayed. However, metal up to ¼" thick, on an area 4" x 6", can be deposited in about one minute. The tool is applicable to many industrial uses. **T-11-3**

Use This Coupon for Complete Information:

For your convenience, a key number follows the announcement of each product reviewed in the *Tools of Today* section of THE TOOL ENGINEER. To obtain complete information on any of these products which may prove useful to you, it is necessary only to circle the corresponding key numbers on this coupon, then mailing the coupon to THE TOOL ENGINEER.

Tools of Today Department, THE TOOL ENGINEER
550 West Lafayette Blvd., Detroit 26, Michigan

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T-11-21 T-11-22 T-11-23 T-11-24 T-11-25 T-11-26 T-11-27

Name .....

Firm .....

Street ..... City, State .....

New Overhang Buffer

A new Heavy Duty **OVERHANG BUFFER**, especially adapted to long and deep work requiring maximum clearance, is now in full production by *The Bradford Machine Tool Company*, Cincinnati 4, Ohio.

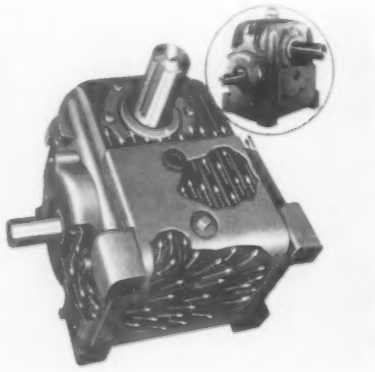
Known as Model "660," the new Buffer is belt driven by ball-bearing motor (N.E.M.A. specifications), with motor platform adjustable for belt tension. Design permits drive belts to be changed without removing housing from shaft. The buffer is equipped with positive shaft lock, magnetic starter, overload protection, and under voltage release. The manufacturer's Electric Tool Catalog No. 3 provides additional information. **T-11-4**

Fan-Cooled Speed Reducers

A new line of fan cooled Cone-Drive **SPEED REDUCERS**, by *Cone-Drive Division* of Michigan Tool Company, 7171 E. McNichols Rd., Detroit, is available in the following sizes:

Center Distance (inches)	HP Rating @ 1750 RPM 5:1	60:1
4	19.8	2.54
5	37.0	4.75
6	59.1	7.87
8	119.2	16.2

These new speed reducers are a culmination of the original concept, in the design of the standard heavy-duty, pinion-under Cone-Drive units, which were designed with fan cooling in mind. Thus, the basic units of the new drive are identical with the non-fan-cooled models of this type, and Cone-Drive HU models already in service may be readily converted to fan cooling, if so desired.



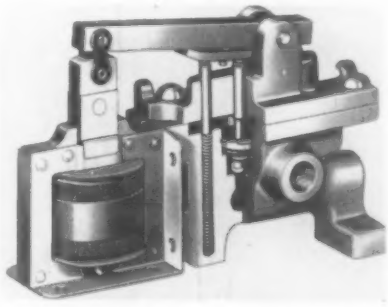
Removable shields, in the new models, direct the fan-impelled air over the finned lower position of the speed reducer housing in such a manner that equalized air-flow is obtained at all points of the housing requiring cooling. The fins are so located and shaped as to guide the streams of air for maximum cooling efficiency. The use of removable shields makes possible two important operating factors.

1. Removal makes the entire housing accessible for cleaning when required (important in locations where air is laden with dust).

2. The impeller and shields may be removed if it is desired to operate the reducer in another location without fan cooling.

In addition to the advantages obtained from fan cooling, a unique system of gearing, in these speed reducers, provides for an increasing number of teeth in actual contact. Thus, the load per tooth is greatly reduced, permitting extremely high horsepower transmitting capacity in relation to size. **T-11-5**

4-Way Solenoid Air Valve



A sturdy, compact, fast-acting **4-WAY VALVE** for industrial use, announced by *Crescent Valve Company*, 6073 State St., Huntington Park, Cal., comprises stainless steel balls travelling between opposed, closely aligned brass seats. It is lever actuated, spring biased, solenoid operated, and may be operated continuously at any practical speed to deliver approximately the full volume of the pressure line with minimum pressure loss. Made in ¼" size only, although, due to abnormal volume output, it may be substituted for many conventional ⅜" valves. **T-11-6**

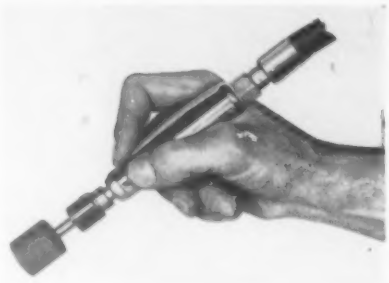
Carbide Grinding Bur

A **CARBIDE GRINDING BUR**, by *M. A. Ford Manufacturing Co., Inc.*, 780 W. First St., Davenport, Ia., has been developed for internal grinding, jig grinding, and blending or fine finishing by off-hand grinding. It works equally well on soft materials or on steels hardened to 65 Rockwell C.

Fast material removal, fine finish, and ability to hold hole shape and tolerances without dressing or set-up adjustments are features claimed for the new tool, which is precision-ground on special machines, insuring uniformity and concentricity. Burs are stocked in standard sizes from 1/16" to ¾" tool diameter, with ¼" wide cutting face, for operation in standard machines at conventional grinding speeds.

T-11-7

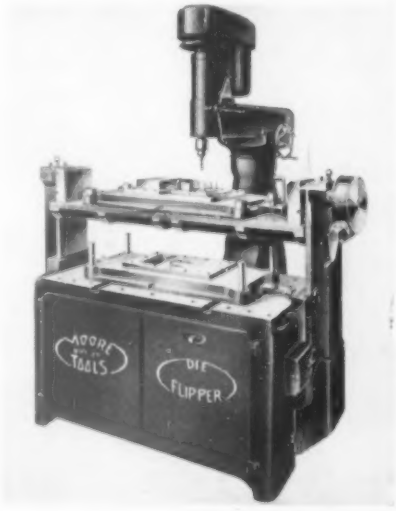
New High Speed Drill



A new, high speed **AIR DRILL**—Model 7022—by the *Aro Equipment Corporation*, Bryan, Ohio, runs at 26,000 rpm and takes twist drills up to ¼" shank size. Recommended for drilling wood and non-ferrous metals, it is also suited for cleaning dies and plastics molds. Because of its small size, which permits clustering in close centers, it is also adaptable for multiple mounting in jigs, fixtures or special drill heads. **T-11-8**

Tryout and Assembly Machine

Partly named the "Die Flipper", a diemaker's **TRYOUT AND ASSEMBLY MACHINE**, by the *Moore Special Tool Company*, Bridgeport, Ct., permits one diemaker to perform practically all operations of die assembling—fit, take apart, turn over, drill, tap and tryout, in addition to visual inspection. The machine is so designed that the platen will hold the punch holder parallel to the die shoe under either compression or tension, with both punch holder and die shoe securely clamped to the machine, thereby preventing pinching of fingers and dropping of heavy parts.



An important "plus" feature is the radial drill, with speeds from 200 to 1200 rpm and capacity up to 1½", which permits drilling straight as well as angular holes. The machine will "flip" a die set 20" x 40", with 12" shut height. Saving handling and effort, the tool should have a strong appeal for diemakers. **T-11-9**

Low-Cost Shaper

The Sheldon-Vernon 12" **SHAPER**, by *Sheldon Machine Company, Inc.*, 4258 N. Knox Ave., Chicago 41, is a small, handy and very capable quality machine designed to work to close tolerances with maintained accuracy. Back geared and powerful, the machine should appeal as supplementary equipment for tool rooms and die shops as well as for small shops and large plants.

T-11-10

Air-Trol Arbor Presses

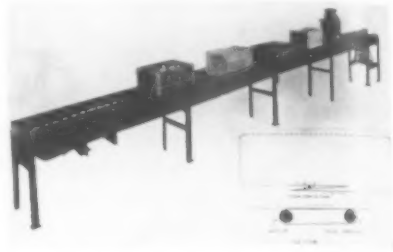
An unlimited range of lengths, in the solid steel shafting that forms the upright columns, features new **AIR ARBOR PRESSES**, by *Air-Trol*, 2651 W. Lake Street, Chicago 12. Thus, the normal ram clearance of 0" to 6", in the standard units, may now be increased (at a nominal extra cost) to any clearance required for special applications. Adding to flexibility, Air-Trol also is prepared to supply supplementary or replacement cylinders, for their arbor presses, with ram stroke of any length required, for quick, easy mounting on the same brackets.

Another flexibility factor is rapid socket wrench adjustment for ram clearance, with no fixed positions required. This permits hair-line vertical adjustments, for ram clearance, and also permits swiveling of the cylinder bracket on the column to obtain better alignment of the ram with the exact area where pressure is to be applied.

T-11-11

New Chain Conveyor

An interesting new type of CONVEYOR, offered by the *Island Equipment Company*, 101 Park Ave., New York 17, merits more than ordinary consideration in the handling of materials. Designed in the form of a Double-Flex chain conveyor, the unit may be used either self contained or in conjunction with other systems, depending on conditions and requirements.

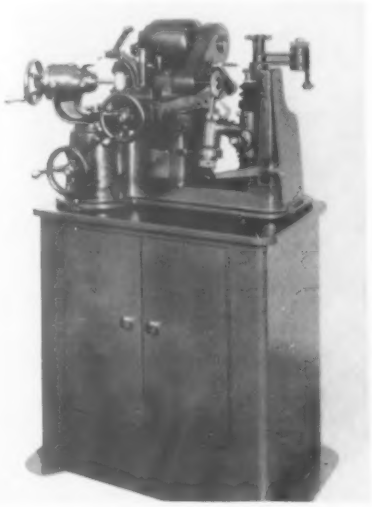


As a feature, a tremendous saving in chain is claimed, obtained through the application of the Ultimate Double-Flex Chain method, otherwise know as Merry-Go-Round or Carousel System. No return chain or tracks are needed, providing a complete loop in any shape (oval, rectangular, offset, L, E, or F shaped). Only the top carrying chain is needed with a loop at Power Unit and Take-up Unit in order to obtain the driving power as shown in sketch below.

T-11-12

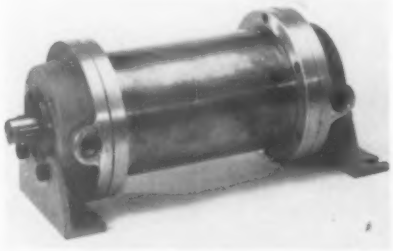
Tap Reconditioner

A new **TAP GRINDER**—Model 1100 HYSCO—by *Henry P. Boggis & Co.*, 12[illegible] West 3rd St., Cleveland 13, Ohio, is a complete tap reconditioning machine that sharpens, relieves chamfers, grinds flutes and spiral or gun points. Capacity ranges from No. 2 (machine screw) to 1½" hand taps, and ⅛" to 1" pipe taps. Two to eight fluted taps, right or left hand, can be sharpened with equal facility. Taps are held in precision collets, which permits reconditioning even though centers are destroyed.



Chamfer sharpening, from 5° to 60°, is done on the left side of the machine, and one complete revolution of the hand wheel grinds and relieves all lands. Flute sharpening and spiral or gun pointing is performed on the right hand side, where the operator has an unobstructed view of the work. Permanently mounted diamond dressers are furnished for truing the chamfer sharpening wheel and for forming radii of the flute sharpening wheel. Nicely engineered, for a specific purpose, and ruggedly constructed, the machine is a cost saver in the reconditioning of taps. **T-11-13**

Dual Cushion Cylinders

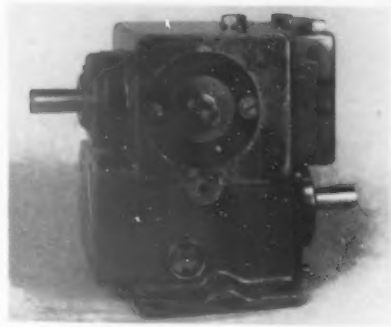


Recently developed by *Hy-Matic, Inc.*, 717 W. 11th St., Los Angeles 15, Cal., a new line of **AIR CYLINDERS** features adjustable cushions at both ends and universal mounting brackets. Designed for holding and tooling operations, the cylinders—Model CA—are designed to operate on either air or hydraulic pressures up to 300 lbs. psi. **T-11-14**

Hydraulic Transmission

A new, small size **HYDRAULIC VARIABLE SPEED TRANSMISSION**, designated as Model T-1 and announced by the *Portman Machine Tool Company*, 70 Portman Road, New Rochelle, N. Y., provides infinitely variable speeds from zero or neutral to full electric drive motor speed in either direction.

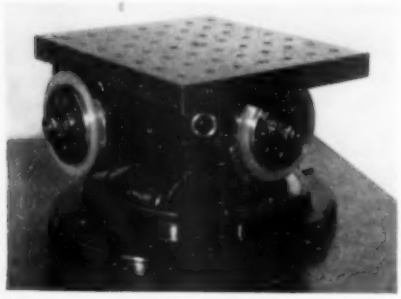
The transmission, which is entirely self contained and does not require any separate oil pump or reservoir, is of the multiple piston constant torque type rated up to 1 HP maximum. Output torque is 52½ pound-inches maximum. Smallest in the Portman line, the unit measures 11" x 7" x 9¼" high. It may



be had with various types of speed controls, including remote control as well as manual. **T-11-15**

Compound Angle Plate

A universal **COMPOUND ANGLE PLATE**—The Studler Model "E", by the *Angle Computer Company*, Glendale, Cal., can be used on the bench, milling machines, jig borers and other machines, and to layout, machine and check work without removing it from the plate. The surface plate may be tilted in two directions from 0° to 90° and rotated 360° on the base. Calibration is by three protractors, each graduated in half degrees, and a vernier provides setting to 10 seconds.



Other Studler angle computers include Models "A" and "A Special", and Models "C" and "G", all with wide ranges of application. The tools are sold through James J. Dillon & Sons, Box 26, Station D, Dayton, Ohio. **T-11-16**

New G-E Tri-Clad Motors

A new line of Tri-Clad brush-shifting adjustable-speed **INDUCTION MOTORS**—type ACA—by the Motor Divisions of the *General Electric Company*, Schenectady 5, N. Y. With the exception of the starter control, the entire unit—available in ratings from 3 to 50 HP (220, 440, and 550 volts)—features stepless speed adjustment over a 3:1 ratio by simply turning a dial. It is self-contained in a housing only a little larger than that for a constant-speed motor of comparable rating. Double-end ventilation provides uniform cooling with low intake velocity. Overload protection and limit switches are built into the motor.

Remote speed control can be accomplished by use of a flexible cable shaft up to 10 ft. away from the motor. For complete remote control, a small pilot motor can be used to drive the speed control mechanism. Applications include driving textile machinery, draft fans, stokers, small paper machines, wire drawing machines, laundry flatwork ironers, dough mixers, cement kilns, stamping presses, and pumps.

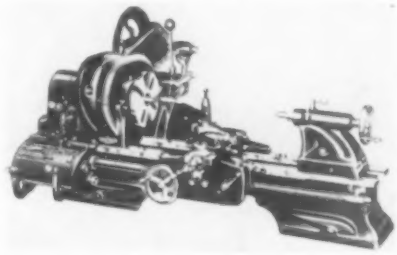
T-11-17

Sheet Feeding Table

The photo of the **SHEET FEEDING TABLE**, by *Lyon-Raymond Corporation*, 3775 Madison St., Greene, N. Y., is practically a "story without words" in itself. Incorporating hydraulic toggle-lever design, the table should appeal especially to production executives in pressed steel products plants, as it will handle and feed to presses and shears, loads of sheet steel up to 5 tons. The table is portable, for transporting loads, and hydraulic elevation permits leveling of load, in relation to press bed, for efficient horizontal feeding. **T-11-18**

New Atlas Q-C Lathe

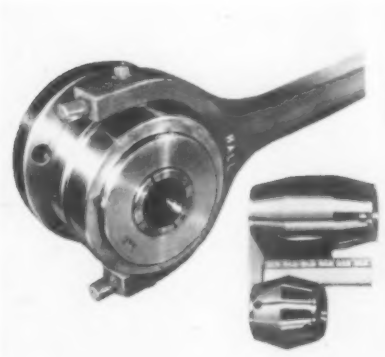
A new, low-cost 10" **QUICK-CHANGE LATHE**, by *Atlas Press Company*, 2314 N. Pitcher St., Kalamazoo 13D, Mich., provides instant, fingertip selection of 54 threads and feeds. Of these, 45 are obtained by merely shifting two levers on the gear box, the other 9 by changing the position of a sliding gear. This does not in any way hurt the odd thread and feed range capacity since, by varying the gear train with change gears, hundreds of additional threads—U.S.S. and metric—are obtained in addition to feeds for wire winding or special tooling.



The machine swings 10½" overhead, 6⅝" over carriage, with two bed lengths—24" and 36" between centers—available. Spindle speeds 28 to 2072 RPM; cutting range, right and left, 4 to 240 per inch. Operates from ⅓ to ½ HP, 1725 RPM motor. **T-11-19**

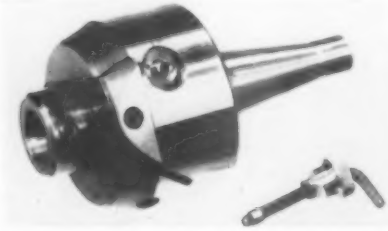
Production Collet Chuck

A new large size **COLLET CHUCK**, of 3″ dia. capacity and designed for production operations, is introduced by the *Hall Manufacturing Company*, 822 Tularosa Dr., Los Angeles 26. Designed for 8″ American A-1 spindle nose lathes, and a companion to the previous 1″ and 2″ capacity Hall models, the new, larger collet chuck incorporates all of the advantages of the smaller models inasmuch as it can be operated without stopping the lathe.



The tool is not sensitive to variations in stock size, is easily adapted to operate expanding arbor collets, and eliminates all latches, fingers, cams, dogs, or ball locks. Furthermore, the operating lever can be set at any angle convenient to the operator. An important feature is that the chuck closes the slotted collet so that grip on the stock is parallel for its entire length, thus providing a 3″ long bearing on the stock. **T-11-20**

Offset Boring Head



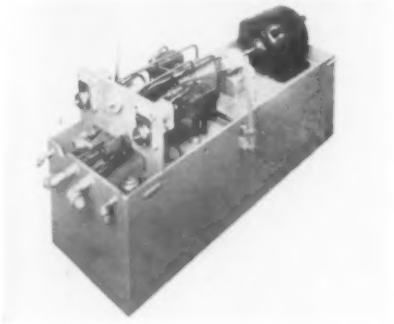
An **OFFSET BORING HEAD**, by *Everede Tool Company*, 2000 No. Parkside Ave., Chicago 39, is furnished with bushings to permit the use of straight type boring bars in place of conventional "shank" type jig boring bars. With the lead screw placed off center, the combination is said to afford an adjustment in the length of the bar, for shallow and deep hole boring, that is not usually possible with the conventional shank type boring bar.

The tool is furnished in two sizes—No. 2-50, with bore capacity to 2¼″, and No. 4-50, with capacity to 6″.

Other new tools, by Everede, include a Lathe Turning Tool which incorporates the Everede triangular tool bit. However, it will also utilize square tool bits. **T-11-21**

New Power Unit

Built for activating any hydraulically driven machinery, a new **HYDRAULIC POWER UNIT**, announced by *Hufford Machine Works*, Redondo Beach, Cal., is completely self-contained with motor, pump, valves and flow controls mounted above the hydraulic fluid reservoir and filter system. Built-in selector valves enable both forward and reverse motion of the machine to which the power unit is applied, and the meter flow controls permit speed of the driven mechanism to be varied over a wide range. The unit is suitable for both manual and automatic operations.

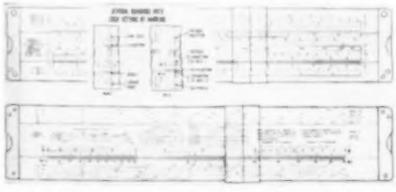


The Hufford power units are regularly available in sizes from 1 to 50 HP (larger if required) and can be furnished in a variety of types from a simple motor-driven pump to complicated systems for all-automatic operation.

T-11-22

Deci. Log Log Slide Rule

A new Deci. Log Log **SLIDE RULE**, by *Pickett & Eckel, Inc.*, 5 S. Wabash Ave., Chicago 3, greatly simplifies computation. The scales, on the front of the rule, are so arranged that only one setting of the hairline gives, with each result, its square root, cube root, and logarithm.

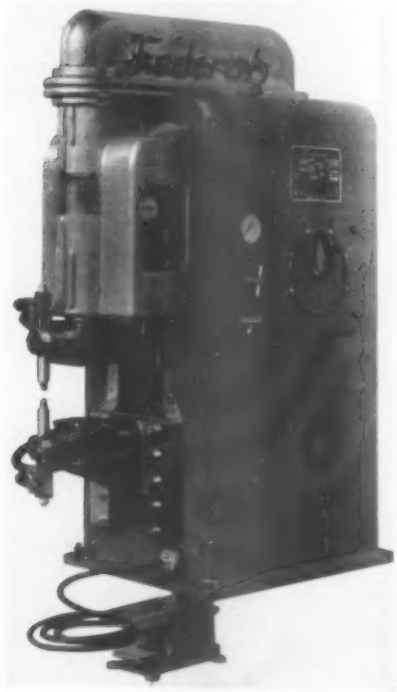


The Log Log scale on the back is expanded for greater accuracy, and arranged to give five readings with each setting of the hairline, viz: Decimal fraction to 4 and 5 figures; its reciprocal to 4 and 5 figures; logarithm; cologarithm; and natural logarithm to base.

The scales read from one ten billionth to ten billion, and give decimal point location. A simple legend tells which scale to read when raising to powers. Being 12⅛" x 2⅛" x 3/16" in size, and made of magnesium alloy with plastic surface bearing permanent, expanded, easy-to-read washable scales, the slide rule comes complete with carrying case, illustrated Instruction Manual and a set of typical problems. **T-11-23**

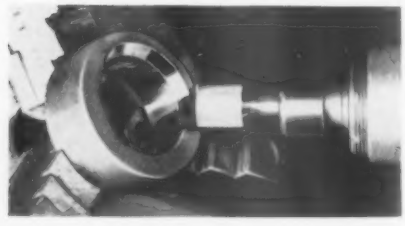
Bench-Type Welder

The *Federal Machine and Welder Company*, 30 Dana Street, Warren, Ohio, announces a new general purpose air-operated bench-type combination **SPOT AND PROJECTION WELDER** for welding mild steel, stainless steel, and aluminum alloys.



The machine, which incorporates several improvements over former designs, is equipped with a special Federal low-inertia rubber head with micro-switch firing. The vertically adjustable lower knee is standard, as are the horns and water-cooled ejector type point holders. Throat depth from the machine face to the center line of the electrodes is 6"; from the machine face to the center of platens, 4½". **T-11-24**

Carbide Micro-Mills

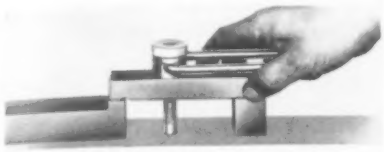


MICRO-MILLS of Cemented Carbide by *Severance Tool Industries Inc.*, Saginaw, Mich., are designed for the speedy precision internal finishing of holes, as an alternate to the common method of employing internal grinding wheels.

Micro-Mills are said to remove material, up to 63-C Rockwell hardness, and, at the same time, to produce finishes comparable to grinding and honing. **T-11-25**

Quick Acting Clamp

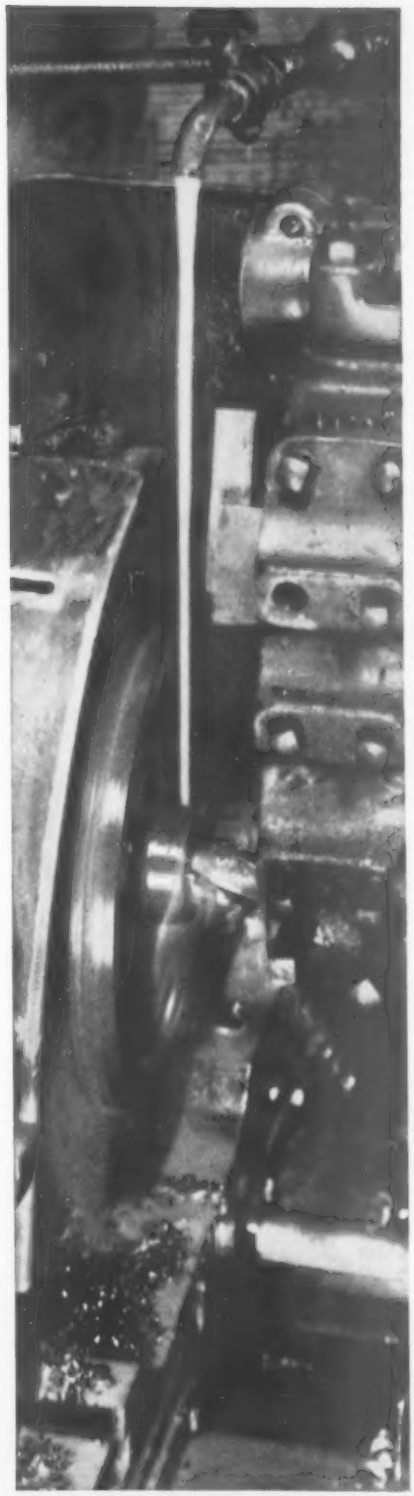
Developed for use with work holding fixtures, or as part of conventional machine set-ups, the **JIG NUT** by *The Jig-Nut Corporation,* 744 Broad St., Newark 2, N. J., eliminates the need for wrenches or tools in clamping workpieces under strap clamps. Made to fit standard stud threads, this quick-acting nut needs only to be screwed down finger tight, more than ample pressure being exerted by the cam action obtained by depressing the handle from vertical to horizontal.



Among advantages claimed are the ability to turn the handle to any position radially before depressing it, and the self-locking qualities which make the clamping action shake proof. This is due to the fact that the cam reaches the anchor point midway in its travel and additional travel serves to lock the action. The nut and screw serve to position the nut for height. **T-11-26**

1500-Ton Hydraulic Press

A new 1500-ton straight side **HYDRAULIC PRESS,** by the *Verson Allsteel Press Company,* Chicago, features fast advance to the work with automatic shift to full pressure stroke. This eliminates high speed impact. Reversal is automatic, either on pressure or distance. The machine, shown here in one of the Verson erecting and testing pits, stands 38′ high, is 19′ long, and 10′ wide. Total weight is 500,000 lbs. Stroke is 48″, with 88¾″ of daylight, and bed area is 96″ x 144″. **T-11-27**



North East West South in Industry

CLARENCE SNYDER, pioneer in mass production and the automotive industry, recently became Ch'n of the Board of **Snyder Tool & Engineering Co.**, Detroit. Others elected were **HOWARD N. MAYNARD**, Pres. and Treas., and **KENNETH B. HOLLIDGE**, Vice-Pres., Sec'y, and a Director.

Hanson and Company, Detroit, announces the appointment of **B. A. JOHNSTON** as Sales Eng'r on their complete line of precision gages, and general precision tooling.

Baker Brothers, Inc., Toledo, Ohio, builders of machine tools, announces the following promotional changes in their organization: **GEORGE E. HALLENBECK**, Chr'm of the Board; **A. L. BAKER**, Pres. and Gen'l Mgr.; **HERBERT L. TIGGES**, Exec. Vice-Pres.; **R. K. CHAPMAN**, re-elected Sec'y and Treas.; **M. E. FISCHER**, Vice-Pres. in charge of Mfg.; **THOMAS L. HALLENBECK**, Vice-Pres. and Dir. of Eng'g; **GLO TEMPLE**, renamed Ch'f Eng'r.

REAR ADMIRAL WILLIAM GRANAT, U.S.N. (Ret.), has joined the firm of **Lester B. Knight and Associates, Inc.**, Chicago consulting engineers. With a long and distinguished record as a Naval officer, engineer, metallurgist and administrator, Admiral Granat's many and varied responsibilities with the Bureau of Ordnance and the Secretary's Office brought him into close contact with many branches of industry, contributing to his broad experience in Research and Development, Production Engineering, Management, and many other fields.

THE CARBORUNDUM COMPANY, Niagara Falls, N. Y., has acquired from the War Assets Administration, at $1,000,000, a part of Plancer 168, formerly occupied by **Bell Aircraft Corporation.** The 65-acre property shown below will be allotted principally to the coated products division for making paper and cloth, and will be used for other expansion purposes. To help increase its production of abrasive silicon carbide ("Carborundum"), 93 acres of industrial property at Vancouver, Wash., has been acquired.

GEORGE E. GREGORY will shortly resign as Vice-Pres. of **Owens-Corning-Fiberglas Corp'n**, Toledo, Ohio, in order to head **MORTON-GREGORY CO., INC.**, now being formed to manufacture and sell new industrial and consumer products calling for a large scale use of new materials, including Fiberglas. These products were developed by a group headed by **HENRY J. MORTON**, Pres. of **H. J. Morton Associates, Inc.**

THE WHITON MACHINE CO., New London, Conn., manufacturers of lathe chucks, centering machines, and gear cutting machines, announces appointment of the following exclusive sales representatives: **Allison - Erwin Co.**, Charlotte, N. C., for North Carolina and the northern part of South Carolina; **The Stauss & Haas Co.**, New Orleans, La., for New Orleans area; **Joseph Monahan**, Grand Rapids, Mich., for Western Michigan; and **R. E. Ellis Eng'g Co.**, Chicago, for Chicago area.

While continuing as a Director of **Bjorksten Research Laboratories, STUART O. FIEDLER** has resigned as Mgr. of the South Chicago Branch to be Mgr. of Research for the **Industrial Rayon Corp'n**, Cleveland, Ohio.

CHARLES R. HOOK, Pres. of American Rolling Mill Co., is the 1947 recipient of the Medal for the Advancement of Research, awarded by the **American Society for Medals.**

E. G. BAILEY, Vice-Pres. of **The Babcock and Wilcox Co.**, New York, has been elected President of The American Society of Mechanical Engineers. Regional Vice-Presidents are **Frank M. Gunby**, Charles T. Main, Inc., Boston; **Paul B. Eaton**, Lafayette College, Easton, Pa.; **Thomas E. Purcell**, Duquesne Light Co., Pittsburgh; and **J. Calvin Brown**, head of the engineering firm of that name, Los Angeles. Directors-at-large include **J. B. Armitage**, Kearney and Trecker Corp'n, Milwaukee; **Abbott L. Penniman**, Consolidated Gas, Electric Light, and Power Co., Baltimore; and **William M. Sheehan**, General Steel Casting Corp'n, Eddystone, Pa.

KNU-VISE, INC., Detroit, has been acquired by **The Lapeer Mfg. Co.**, Lapeer, Mich. The Knu-Vise line of toggle-action clamping devices will continue to be manufactured under that name, with sales office at 2906 W. Grand Boulevard, Detroit 2. Formerly Pres. of Knu-Vise, Inc., **J. A. HERRINGTON** is now Pres. of the Lapeer Mfg. Co.

DAVID F. SKLAR, formerly Ch'f Design and Development Eng'r with the Wilson Mechanical Instrument Co., Inc., has formed the **Kent Cliff Laboratories**, Peekskill, N. Y., for the purpose of consultation, development, and manufacture of hardness testing equipment and associated apparatus.

Prussian Machinery Co., Inc., 1475 East Grand Blvd., Detroit 11, designers and builders of machine tools, has announced the change of its corporate name to **GEORGE R. SHUMAN, INC.**

EDWARD HANLEY, Vice-Pres. in charge of finances, Sec'y and Treas., has been elected to the Board of the **Allegheny Ludlum Steel Corp'n**, Pittsburgh. **STANLEY A. McCASKEY** has been elected as Sec'y to relieve Mr. Hanley of that duty.

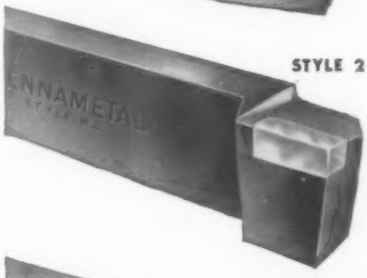
DR. HUGH H. MOSHER, formerly with Onyx Oil & Chemical Co. as Vice-Pres. in charge of Textile Research & Development, has been appointed Director of Organic Research at **Quaker Chemical Products Corp'n**, Conshohocken, Pa.

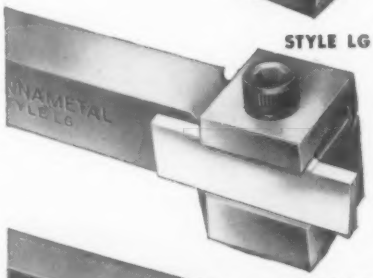
The appointment of **J. K. (JACK) SUTHERLAND** as Sales Mgr. of **Benchmaster Mfg. Co.**, 2960 W. Pico Blvd., Los Angeles 6, is announced. He formerly was sales mgr. of Diamond Machine Tool Co., Los Angeles.

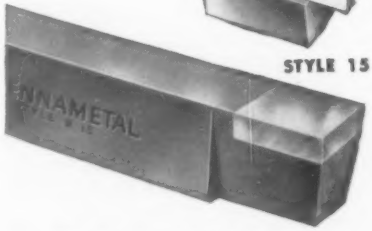
The **UNITED ALUMINUM CASTINGS CO.**, in new and larger quarters at 3471 W. 140th St., Cleveland, Ohio, has greatly expanded facilities for the faster production of castings of aluminum and aluminum alloy.

THE JAMES F. LINCOLN ARC WELDING FOUNDATION is sponsoring a series of $6,750 Annual Engineering Undergraduate Award & Scholarship Programs. Some 77 awards, running from $1000 down to $25, will be made annually to engineering students of institutions in the United States offering an engineering curriculum. Basis for the awards will be papers submitted on arc welded design or the use of welding in maintenance of machines and structures. The institution in which the first three winners are registered will receive scholarship funds.

KENNAMETAL Cutting Tools







The Kennametal tools shown above are representative of more than 60 standard styles—each designed to increase the productivity of machine tools, and reduce tooling costs, on specific metal-cutting jobs.

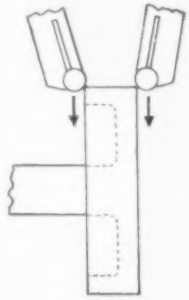
INCREASE THE PRODUCTIVE CAPACITY OF MACHINE TOOLS UP TO 500%

Hard, durable Kennametal cemented carbide cutting tools can turn out from two to five times as much as high speed steel tools on the same machine and in the same time, because—

—they make possible machining at speeds 3 to 10 times as fast as with high speed steel tools,

—last many times as long before needing resharpened, thereby greatly reducing machine down-time, and

—cut tougher steels and hard, abrasive cast-iron, as well as steel in the hardened state, thus often saving annealing and rehardening operations.



It's good business to invest thousands of dollars in faster, more powerful machine tools. It's even better business to invest a few extra pennies in long-lived Kennametal cutting tools that enable the machine tool to produce more, in less time, at less cost. For example:

On the straddle-facing job sketched at the right, recently-developed Kennametal "clamped-in solid round" tools (Style 6RS illustrated) have increased production 20%, and are saving $10.00 per tool per day. This is not extraordinary performance —it is a typical example of the outstanding results obtained by using Kennametal cemented carbide instead of other tool materials, and skillfully engineering it to the job.

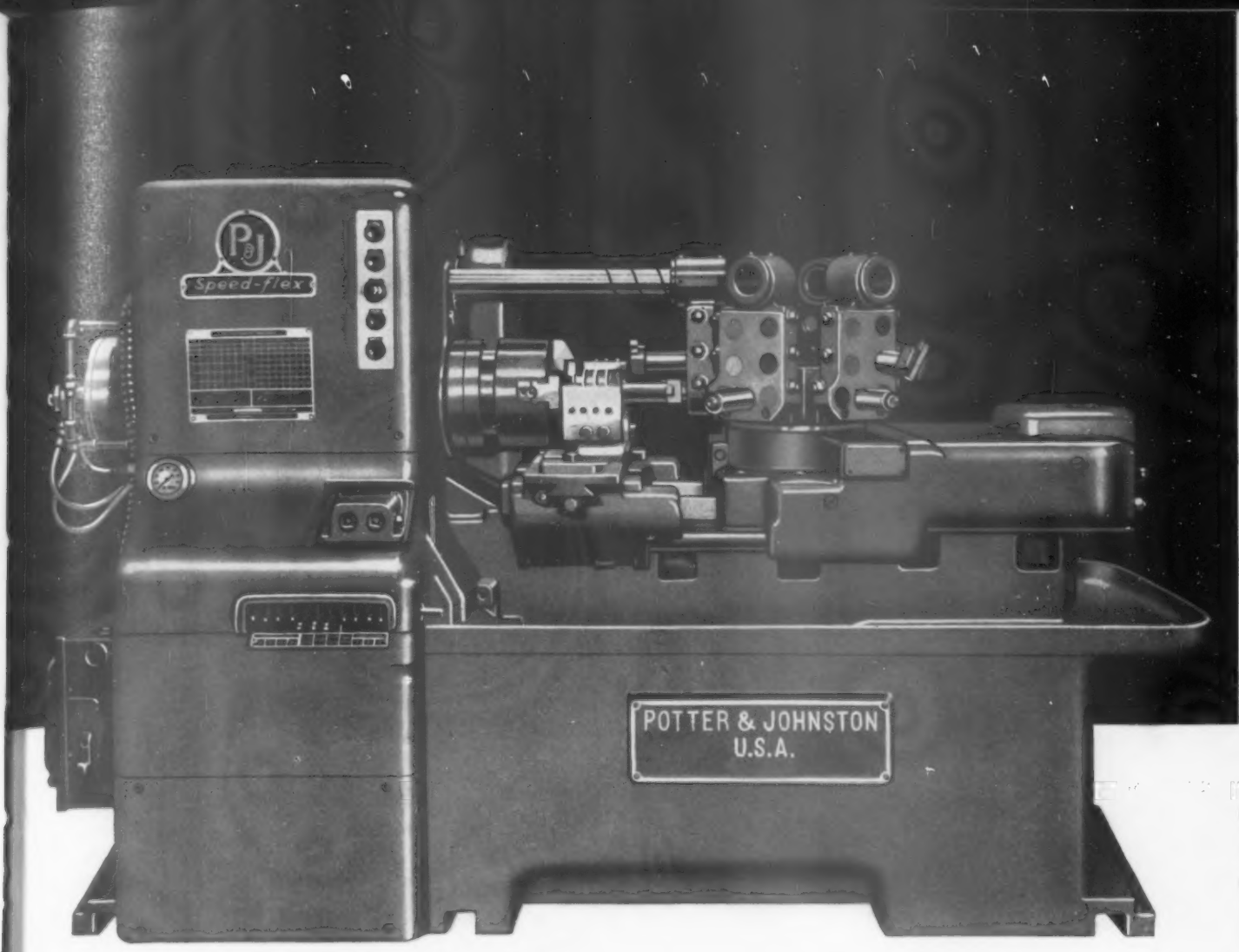
Kennametal tool engineers are at your service to help you get more work from your machine tools. Call upon them. ● Kennametal standard tools, that will handle up to 90% of all machining jobs, are listed and priced in Catalog 47. Write for a copy.

TRADE MARK REG. U. S. PAT. OFF.

KENNAMETAL *Inc.*

LATROBE, PA.,

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION



Here is some **NEWS** that can be parlayed into profit

Potter & Johnston's new

3-U SPEED-FLEX

AUTOMATIC TURRET LATHE

Potter & Johnston's new 3-U SPEED-FLEX AUTOMATIC TURRET LATHE, lighter and more compact than any previous P. & J. model, occupies only 16 square feet of floor space, and handles the same size work at greatly increased speed. Here is a machine that has six turret faces, electro-pneumatic control, versatility of tooling, a wide range of spindle speeds, and is designed to machine castings and forgings—both ferrous and nonferrous—up to six inches in diameter. To management, this is good news, particularly when it is considered that the 3-U SPEED-FLEX is so fast, so accurate, and constructed to occupy such a minimum of floor space. These introductory notes are spot news; complete coverage on the 3-U SPEED-FLEX will be sent on request.

POTTER & JOHNSTON

MACHINE COMPANY, PAWTUCKET, RHODE ISLAND

Reduces Cost of Machine Base 40% by Change to Welded Steel

Fig. 1. The Bostitch Stitcher with conventional base.

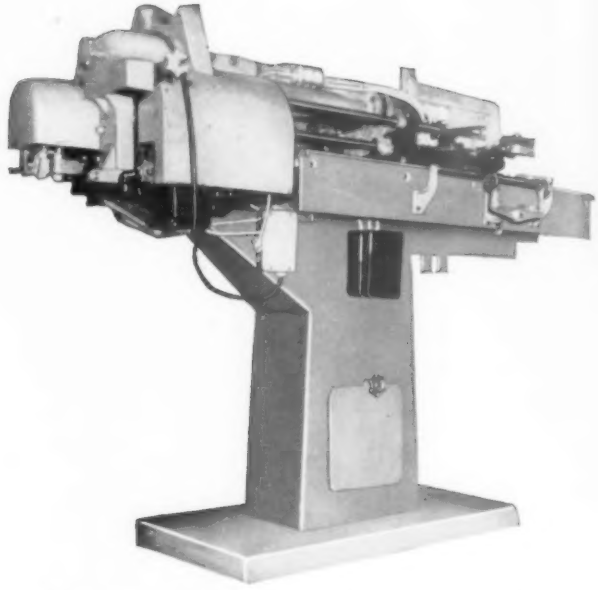


Fig. 2. Rear view of same machine, mounted on new welded base which cost 40% less.

By R. H. Dell, Chief Engineer
Boston Wire Stitcher Company, Westerly, R. I.

CONFRONTED with ever-rising casting costs for the base of the Bostitch Automatic Box Stitcher, we decided to try welded steel design. The result is a base that costs 40% less and is 30% lighter in weight.

Fig. 1 shows the Stitcher with its original base of conventional design, and Fig. 2 shows the same machine, photographed from the opposite side, mounted on the new welded base.

Fig. 3. The welded base without mechanism.

We had been getting the base from an outside foundry and wished to continue having it fabricated outside, so asked commercial welderies for prices on the welded base. This put the former design and the welded design on the same competitive basis.

The lowest bid on the welded base was 40% less than the price we had been paying for the former design. There was also a weight reduction of 30%, the welded base weighing only 525 pounds as compared with the former design's weight of 750 pounds.

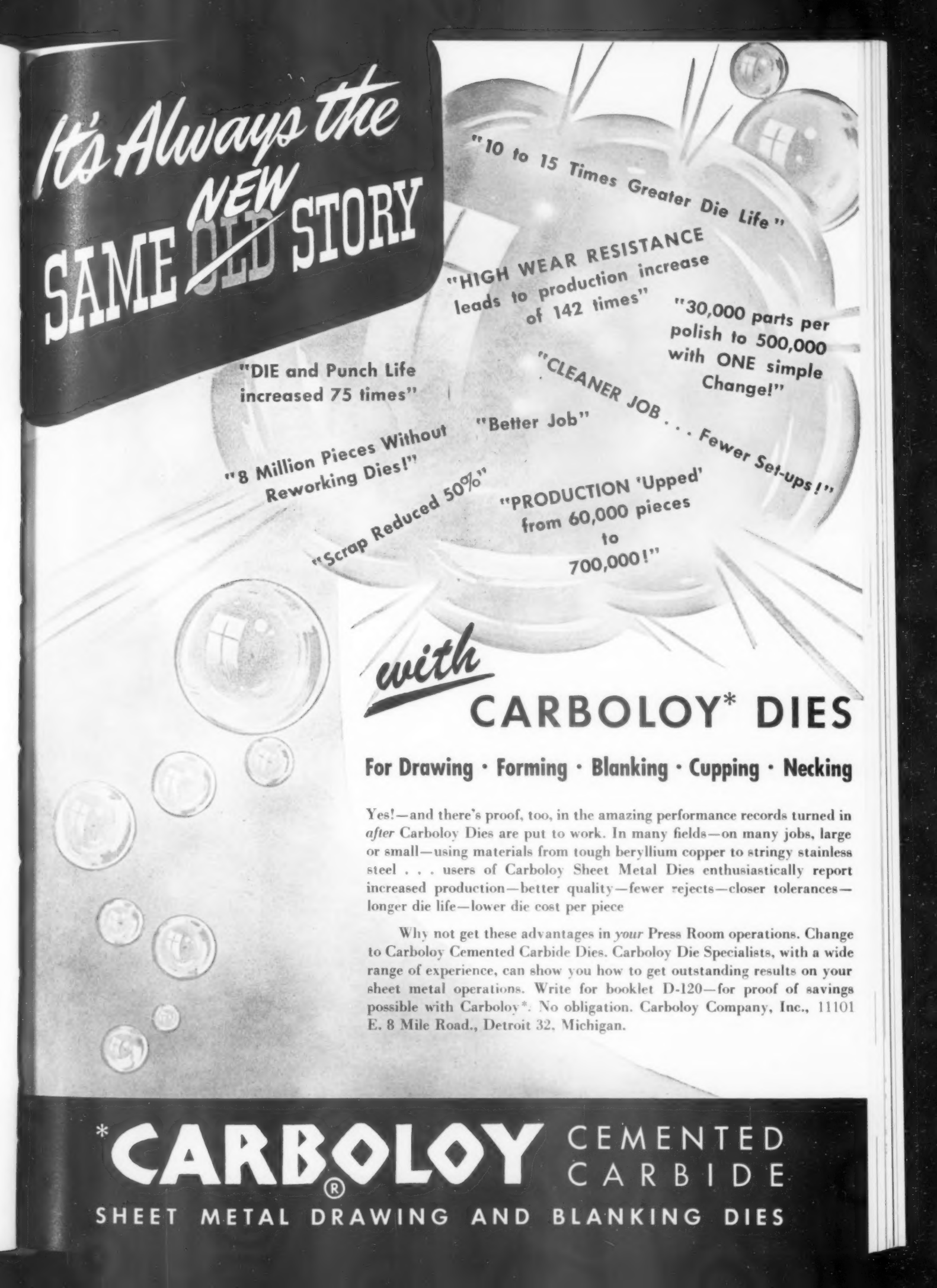
Fig. 3 is a close-up of the welded base. The main designing consideration was the great amount of pounding it takes, due to the action of the mechanism in making up to 400 stitches per minute in heavy cardboard containers.

The pedestal, of liberal dimensions to counteract vibration, is one piece of 5/16" plate. Corners are notched out, sides bent down and butt-welded at the corners. The column is four pieces of 5/16" plate, flame-cut to shape and corner welded. To minimize material at the top of the column, bare angle irons 3/8" thick are used for the table mountings. The gusset support had to be extremely strong to absorb the main impact loads, so its top support plate is 1" thick and sides and bottom are 1/2" plates.

All welds are single pass, square butt welds, not scarfed. "Fleetweld 7" electrode is used.

After changing to the welded base, we discovered an additional market for the same machine with the base 10 1/2" shorter. To make the adaptation, all we did was cut 10 1/2" off the bottom of the vertical column before the weldment was assembled. This flexibility of welded design gives us a further advantage.

The above is published by LINCOLN ELECTRIC in the interests of progress. Machine Design Studies are available to engineers and designers. Write The Lincoln Electric Company, Dept. 416, Cleveland 1, Ohio.



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Yes!—and there's proof, too, in the amazing performance records turned in *after* Carboloy Dies are put to work. In many fields—on many jobs, large or small—using materials from tough beryllium copper to stringy stainless steel . . . users of Carboloy Sheet Metal Dies enthusiastically report increased production—better quality—fewer rejects—closer tolerances—longer die life—lower die cost per piece

Why not get these advantages in *your* Press Room operations. Change to Carboloy Cemented Carbide Dies. Carboloy Die Specialists, with a wide range of experience, can show you how to get outstanding results on your sheet metal operations. Write for booklet D-120—for proof of savings possible with Carboloy*. No obligation. Carboloy Company, Inc., 11101 E. 8 Mile Road., Detroit 32, Michigan.

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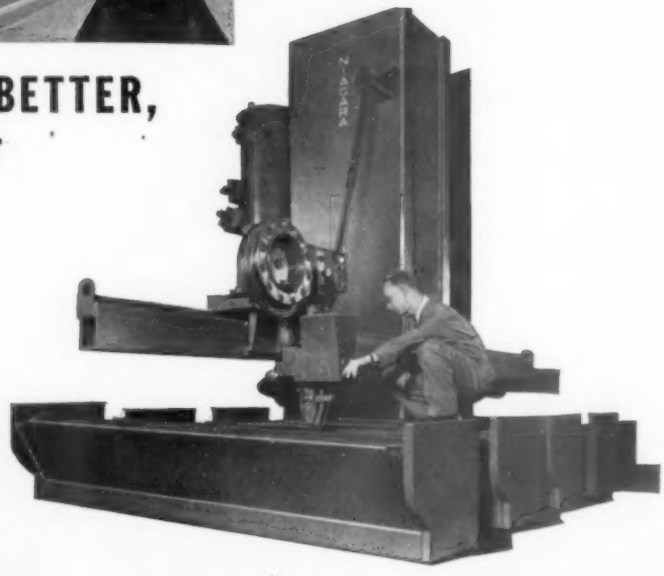
with this new

NIAGARA *Electronic*

Automatic Welding Machine



High welding current, fast welding, less passes per seam, deep penetration, silvery uniform bead, minimum distortion, easy one-man operation,— you get all these advantages and economies with this new Niagara Electronic Automatic Welding Machine. Write for new Bulletin 83 for the facts.

NIAGARA MACHINE & TOOL WORKS

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District Offices: CLEVELAND • NEW YORK • DETROIT

5,000 Holes per day

with CLE-FORGE HIGH SPEED DRILLS

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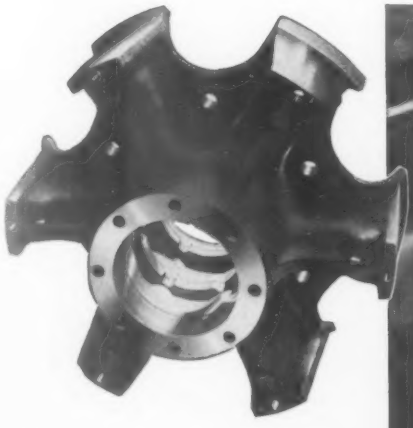

Three multiple spindle set-ups, one of which is illustrated at the right, are employed to drill the 20 holes in this cast steel truck wheel. An average of 250 wheels are drilled each day—a total of 5,000 holes. CLE-FORGE High Speed Drills are given much of the credit for maintaining this production rate.

This job is typical of many where CLE-FORGE High Speed Drills have demonstrated their superior performance. Because these drills produce *more holes per grind,* they are an important factor in reducing "down time" and increasing output. If you have not already used CLE-FORGE High Speed Drills and experienced their many advantages, we urge you to . . .

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LATEST DEVELOPMENT
IN AUTOMATIC GRINDING

"GAGE-SIZE" means combination Gage-Matic and Size-Matic automatic sizing controls—*both* in this new Heald No. 271 Internal.

Heald's brand NEW Internals grind more holes... faster... at less cost

HERE'S THE ANSWER to your large scale grinding problems — a complete *new line* of Heald Gage-Matic and Size-Matic Internals, *the result of over 20 years' experience in automatic grinding development.* This new line includes a model exactly suited to your particular job.

Grinding cycles are entirely automatic once the work is loaded and the starting lever advanced. You obtain extremely accurate results and maximum production with minimum effort. The reason is improved construction, new design.

NEW FEED MECHANISM enables cross-feed cycle and table speeds to be instantly and accurately set for rate and amount... lessens setup time.

UNIFORM SPEEDS AND FEEDS remain constant throughout the day without adjustment... maintain definite production, finish and accuracy.

SEALED HYDRAULIC SYSTEM prevents leaks and entry of coolant or dirt... insures long life and trouble-free operation.

CENTRALIZED CONTROLS • ANTI-FRICTION WHEELSLIDE PERMANENTLY LUBRICATED WHEELHEADS • COMPACT DRESSER • ISOLATED HYDRAULIC RESERVOIR.

All these features help to make the new Heald Internals more convenient to operate and easier to maintain. For specific applications, get in touch with the Heald branch office nearest you.

ANOTHER OF *18 NEW* HEALD MACHINES

SEND FOR *FREE* BULLETIN on the Heald Nos. 271-371 Automatic Internal Grinding Machines. Complete with photographs, features, specifications. Write:

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

HOW THIS *Seeing* TOOL AIDS PRECISION AND SPEEDS THE WORK

Magnify the *image* . . . magnify the *skill* and *output.*

You set up this sequence by providing the Dazor *Floating* Magnifier for each employee engaged in precision tool operations, assembly or inspection.

Newest of the Dazor seeing aids, the magnifier makes a sharp, clear enlargement of objects in the field of vision and lights them with soft, cool fluorescent illumination at the same time. A 5-inch circular lens and three 6-watt fluorescent tubes occupy the unified magnifier head, which the user places to suit his need. A touch of the hand raises, lowers, swings or tilts the instrument—*floats* it to the desired position. There it stays without fastening, held firmly by the patented Dazor *Floating* Arm.

Fortified with better visual conditions, operators see details more distinctly . . . machine parts with greater accuracy and safety . . . use equipment to better advantage. Inspectors, assemblers and draftsmen receive parallel benefits in the form of glare-free vision, a reduction in errors, higher productive capacity.

The flexible Dazor *Floating* Magnifier can also add to the accomplishments of your training department, laboratory, first aid room—any phase of the business that depends upon concentrated seeing for its efficiency.

Phone Your Dazor Distributor for details and an early demonstration. If you wish the name of this helpful lighting authority, write Dazor Manufacturing Corp., 4481-87 Duncan Ave., St. Louis 10, Mo. *In Canada* address inquiries to Amalgamated Electric Corporation Limited, Toronto 6, Ontario.

MOVES FREELY INTO ANY POSITION AND STAYS PUT—*WITHOUT* LOCKING

CHOICE OF 2 BASES

UNIVERSAL

The model pictured above is equipped with this base; it can be clamped or screwed to any surface—horizontal, sloping or vertical.

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Also available in a portable floor-type unit (with pedestal base) for physicians, first aid rooms, schools, libraries, etc.

DAZOR FLOATING MAGNIFIER WITH FLUORESCENT LIGHTING

WINTER *Commercial Ground* TAPS

Leadership BUILDS ON *Craftsmanship*

WINTER Commercial Ground Thread Taps are the ideal choice for accuracy and economy. They are form ground after hardening by an exclusive WINTER process, and will work freely—even on tough materials. For faster, easier tapping to reasonably close limits, with less strain on tool and work, specify WINTER Commercial Ground Thread Taps.

Craftsmanship of the highest order always has been employed in the manufacture of WINTER Taps.

Always at Your Service

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

Winter Brothers COMPANY

ROCHESTER, MICH. and WRENTHAM, MASS. • Distributors in Principal Cities
A Division of the National Twist Drill and Tool Company • Branch Stores: San Francisco, Chicago, Detroit

NATIONAL *Inverted* SPOTFACERS

Craftsmanship INSURES *Quality*

NATIONAL Spline-Drive Inverted Spotfacers combine ruggedness, positive driving and accurate alignment with long life and easy assembly. The drive is accomplished through splines that are part of the pilot, bearing against slots in the cutter. The cutter is retained by solid shoulders on the pilot. Removal is simple; just turn cutter backwards on the pilot and slide off. Spline-Drive Inverted Spotfacers are part of NATIONAL'S complete line of Rotary Metal Cutting Tools.

Call Your Distributor

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools. Call them for cutting tools or any other staple industrial product.

The skill and facilities to make NATIONAL Tools the best you can buy are supplied at NATIONAL'S great new plant in Rochester, Michigan.

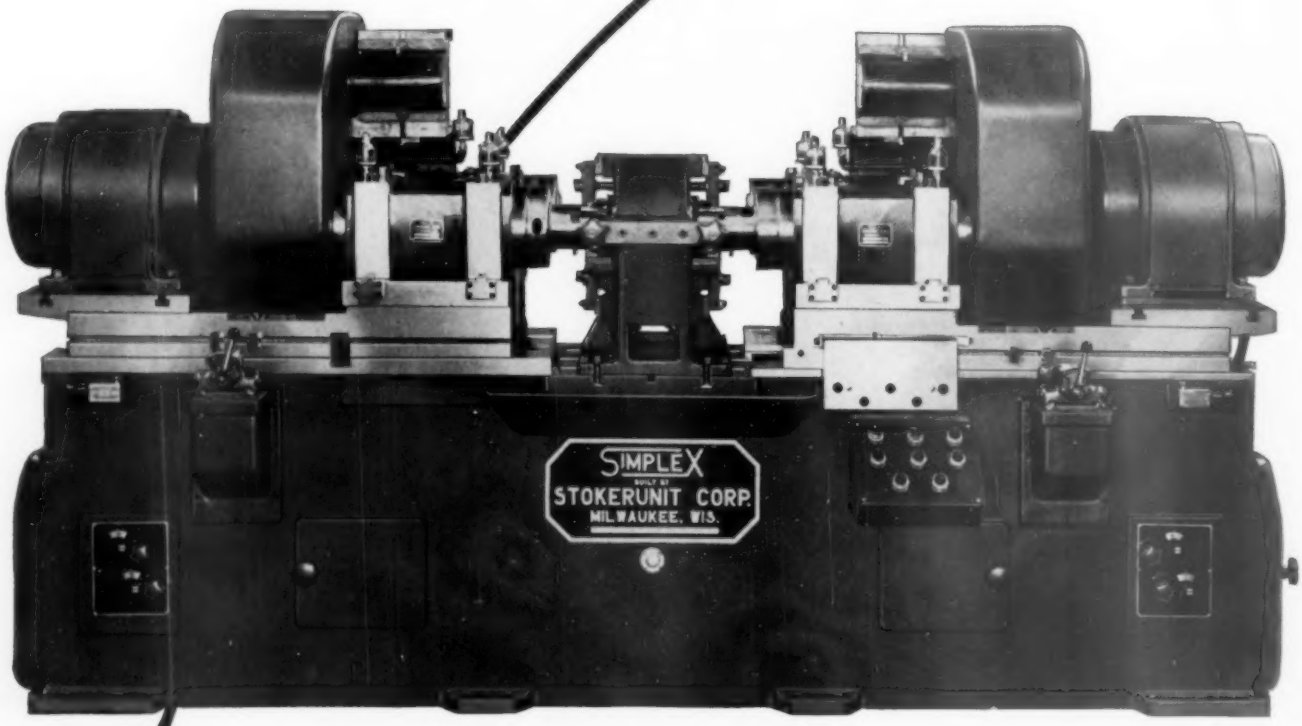
NATIONAL TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICHIGAN, U. S. A. Tap and Die Division — Winter Bros. Co.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

SIMPLEX

DIESEL ENGINE CONNECTING RODS are difficult to bore to modern standards of accuracy and finish. Here, in one machine, all rough and finish boring, facing and chamfering operations are performed in minimum time.



The machine is a SIMPLEX 3U 2-way Precision Boring Machine with left-hand table mounted on hardened dovetail ways for rough boring, chamfering and facing one side of both ends. The piece is then reloaded on the right side of the fixture. The right-hand unit finish bores, chamfers and faces the other side. Heavy precision boring spindles, with powerful drives from 7 ½ HP motors, provide excellent finish and accuracy at low unit cost.

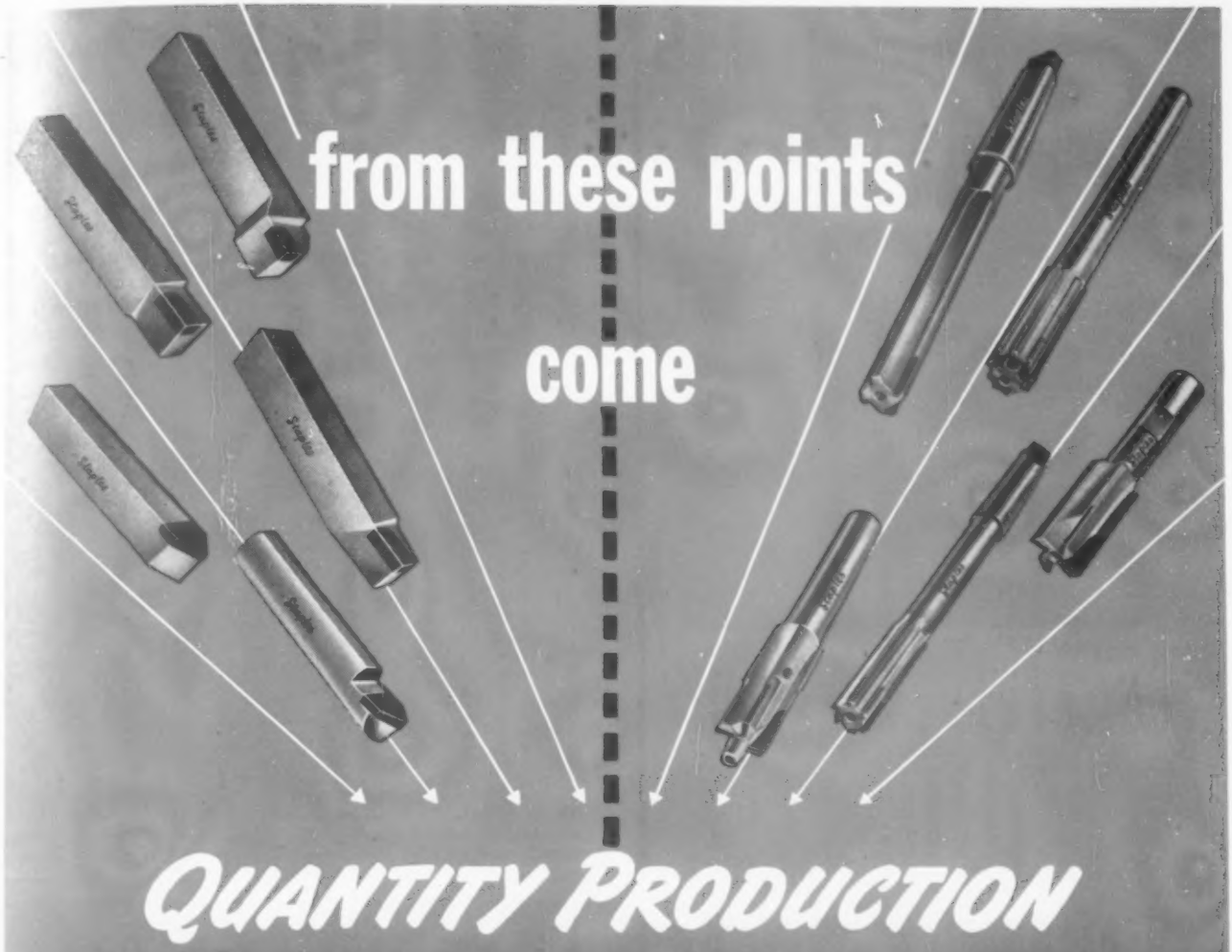
Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools



STAPLES CARBOLOY-TIPPED TOOLS

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Tool up for higher production with Staples Carboloy-tipped Tools. Now, Staples offers one of the most complete high-quality lines of carbide-tipped tools available today.

Get faster, deeper cuts from Staples single point tools—roller turner, turning, boring, facing tools—milling cutters, form tools.

Get precision hole production from Staples reamers, counterbores, end mills, spotfacers, core drills.

For all *special* tools, submit your requirements to Staples Design and Engineering Service.

To profit in higher production at minimum tool cost, make Staples your Carboloy tool headquarters. Write today for complete information on standard tool designs and prices.

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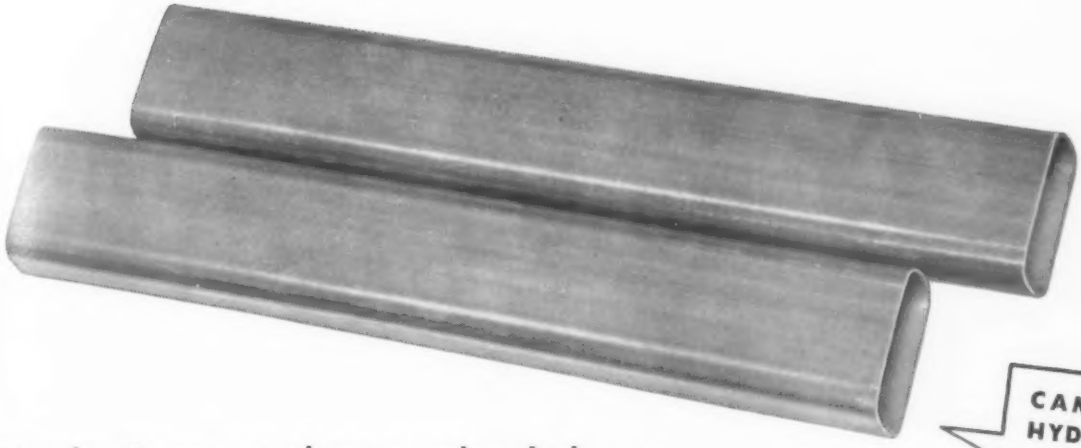
✓ *write for your complete Staples Tool catalog*

Staples CARBOLOY CEMENTED CARBIDE TOOLS

A COMPLETE LINE OF SINGLE AND MULTIPLE POINT CUTTING TOOLS

EXPANSION REAMERS • FORM TOOLS • CENTERS • MASONRY DRILLS • SPECIAL TOOLS

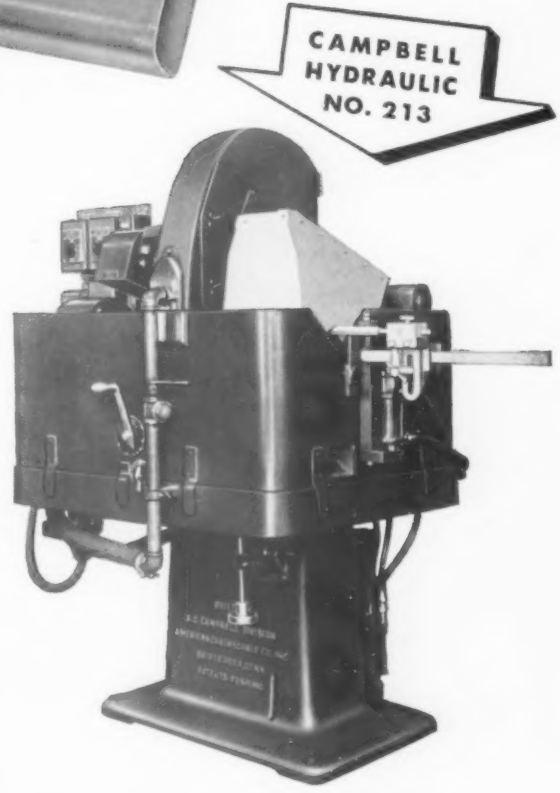
CUTS IRREGULAR SHAPED TUBING ABRASIVELY—4 TIMES FASTER!



Production more than quadrupled over other methods by putting this operation on Campbell 213 Wet Abrasive Cutting Machine.

BRIDGEPORT, CONN.—The tubing illustrated is 1¼" x 2¼" with 1/32" wall. Because of its shape it presented a problem when cut by ordinary methods. By putting it on the Campbell 213, actual cutting time was reduced from more than half a minute to only 2 seconds per cut. Result—faster cuts to close tolerances, no distortion, minimum burr.

Campbell offers a complete range of abrasive cutting machines, including wet and dry, hand-operated, semi-automatic and full automatic. They are more than just cut-off machines. In many cases, we have designed fixtures which adapt abrasive cutting to operations such as this tube-cutting job formerly done by other types of machines. And the result has been greatly reduced production costs.



***Perhaps you have operations** which could be profitably done by abrasive cutting. Our engineers will be glad to work with yours.*

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ANDREW C. CAMPBELL DIVISION
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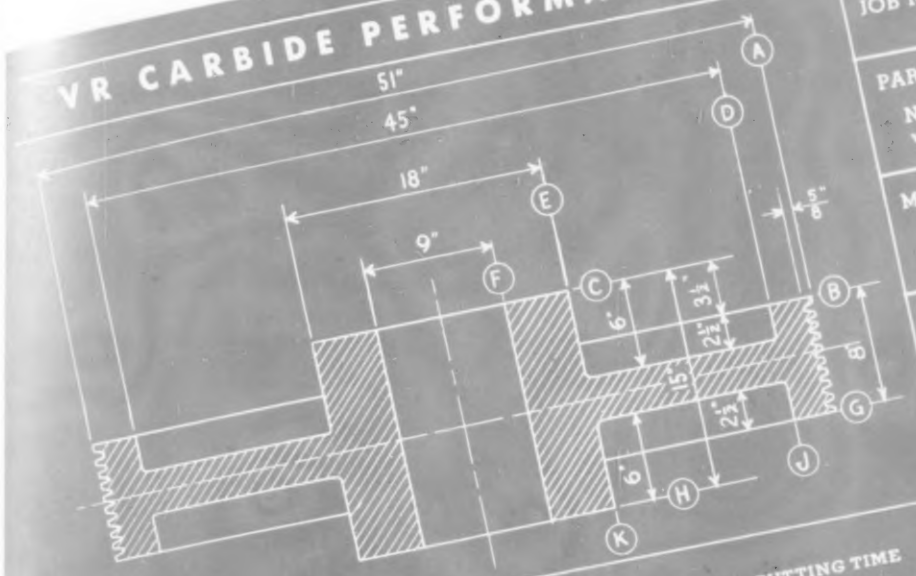
*V-R Carbide

. . . increased production

600%

VR CARBIDE PERFORMANCE DATA



JOB No.

PART: Nine groove sheave wheel—51" diameter.

MACHINE: Vertical Bullard 64" Cutmaster.

MATERIAL: Tough cast iron.

OPERATIONS: Roughing, finishing and forming Boring and facing.

REVISIONS

DETAILED OPERATION DATA:

SURFACES	S. F. M.	FEED	DEPTH OF CUT	LENGTH OF CUT	CUTTING TIME
A	250	.031	5/8" - 3/4"	8"	16 minutes
B	250	.060	3/8" - 1/2"	3"	
C	250	.060	"	4½"	
D	250	.060	1/8" - 1/4"	2½"	
E	250	.030	"	6"	15 minutes
F (rough)	275	.030	3/8" - 1/2"	15"	18 minutes
F (finish)	275	.021	.040	15"	
9 grooves	250	.021	5/8"	160" (each)	11 minutes
G	250	.060	3/8" - 1/2"	3"	
H	250	.060	"	4½"	
J	250	.060	1/8" - 1/4"	2½"	
K	250	.060	1/8" - 1/4"	6"	

Comparative Analysis: Actual machining time with VR carbide . . . . 60 minutes
Actual machining time using high speed steel tools . . . . 10 HOURS
VR carbide tool life . . . . . 1½ to 2 pieces

MAKERS OF WORLD'S FINEST VR Carbides

SEND for your free copy of the NEW VR-400 Carbide Tool and Blank Catalog. 32-pages of vital carbide engineering information. Address Dept. TC547.

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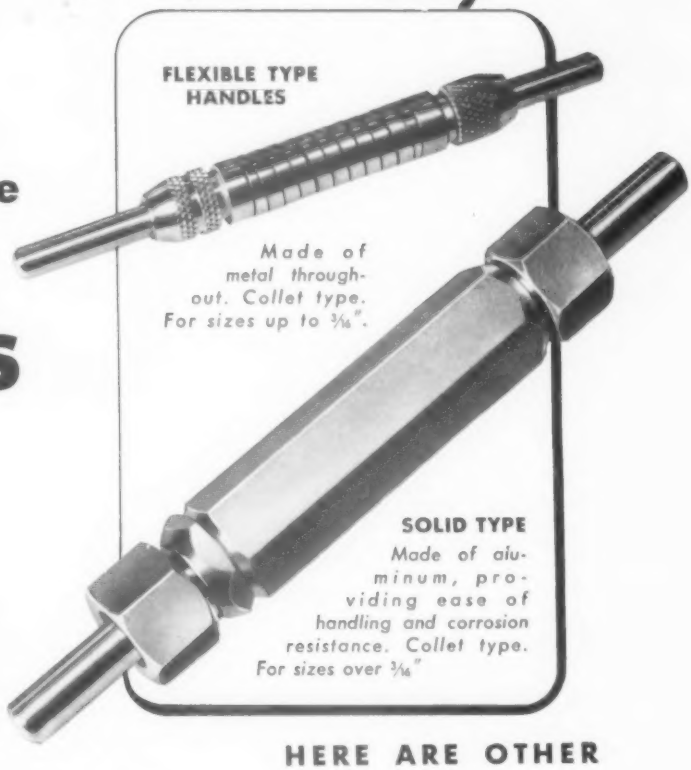
Long, Accurate Gage Life!

WITH THESE

LINCOLN PARK

Reversible Wire Type

CARBIDE PLUG GAGES



If you use plug gages under 3/8" diameter, you owe it to yourself to compare these Lincoln Park gages—in eventual cost, lasting accuracy and practicability—with any other gages used for the same purpose.

Lincoln Park Wire Type Plug Gages made of cemented-carbide are approximately two and one-half times the price of similar gages made of steel. But the accurate service life of these gages is at least fifty times greater than can be expected of the best steel gages. In addition, wear-resistance allows users to disregard wear allowance for gage life and take advantage of full print tolerances—a feature which reduces to a minimum the rejection of parts due to inaccurate inspection.

They are available in a size range from .025" to .510", in either Class XX or X tolerances, and are supplied with all-metal handles of the types illustrated.

The Light-Weight Flexible Handle

Supplied For Sizes Up To 3/16"

. . . is an exclusive feature of Lincoln Park Reversible Wire Type Plug Gages. As illustrated, hazard of breakage of members due to accident or rough handling is greatly reduced. (For gages over 3/16", solid aluminum, collet type handles are supplied.)

HERE ARE OTHER

Unusual Advantages

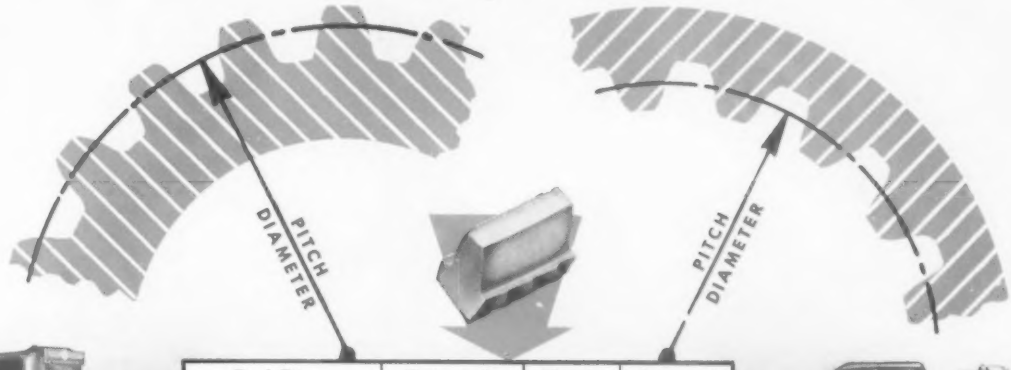
OFFERED BY THESE REVERSIBLE WIRE TYPE CARBIDE PLUG GAGES

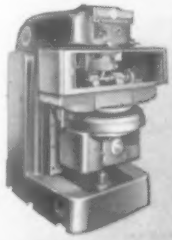
- **High elastic limit of carbide insures against bent or deformed wires.**
- **Being non-corrosive, members will not rust in the handle or in storage.**
- **Since carbides are non-magnetic, the gages will not pick up chips or other metallic substances which might scratch work.**
- **Members are easily adjusted for length by loosening nuts in ends of handle and can be cut off as worn and reversed in handle.**

Lincoln Park **INDUSTRIES, INC.**

1729 FERRIS AVENUE • DETROIT 25, MICHIGAN

SPUR AND HELICAL GEARS ARE SHAVED AND CROWNED ON THESE RED RING MACHINES





Model "GCU" Diagonal

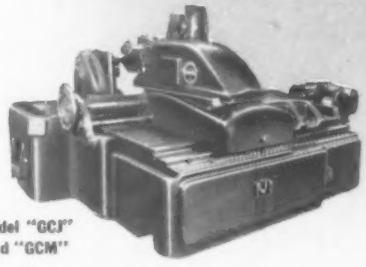
Model "GCL" Fine Pitch

Red Ring Machine Designation	External Gears Pitch Dia.	Teeth May Be Crowned	Internal Gears Pitch Dia.
GCL-3"	3/16"— 4"		
GCI-8"	1"— 8"	Yes	3"— 8"
GCI-12"	1"— 12"	Yes	3"—12"
GCI-18"	2¼"— 18"	Yes	3"—18"
GCP-24"	3"— 24"	Yes	
GCU-8" Diagonal	1"— 8"	Yes	
GCU-12" Diagonal	1"— 12"	Yes	
GCR-12"			3"—12"
GCJ-36"	4"— 36"	Yes	
GCM-36"	4"— 36"		
GCQ-36" Standard	12"— 36"		12"—36"
GCQ-36" Spec. Small	5"— 30"		5"—30"
GCQ-48"	22"— 48"		22"—48"
GCM-48"	4"— 48"		
GCK-96"	24"— 96"		
GCK-120"	48"—120"		

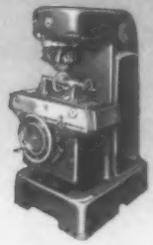
Write for descriptive folder on the machine in which you are interested.

Model "GCR" Internal

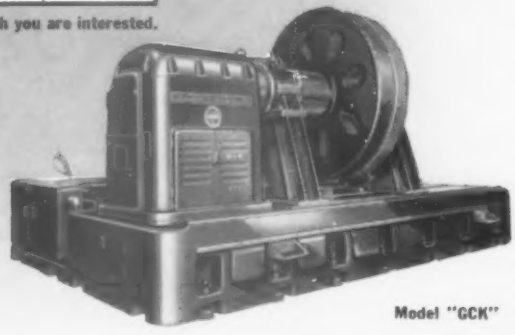
Model "GCQ"



Model "GCJ" and "GCM"



Model "GCI" and "GCP"



Model "GCK"

RED RING PRODUCTS

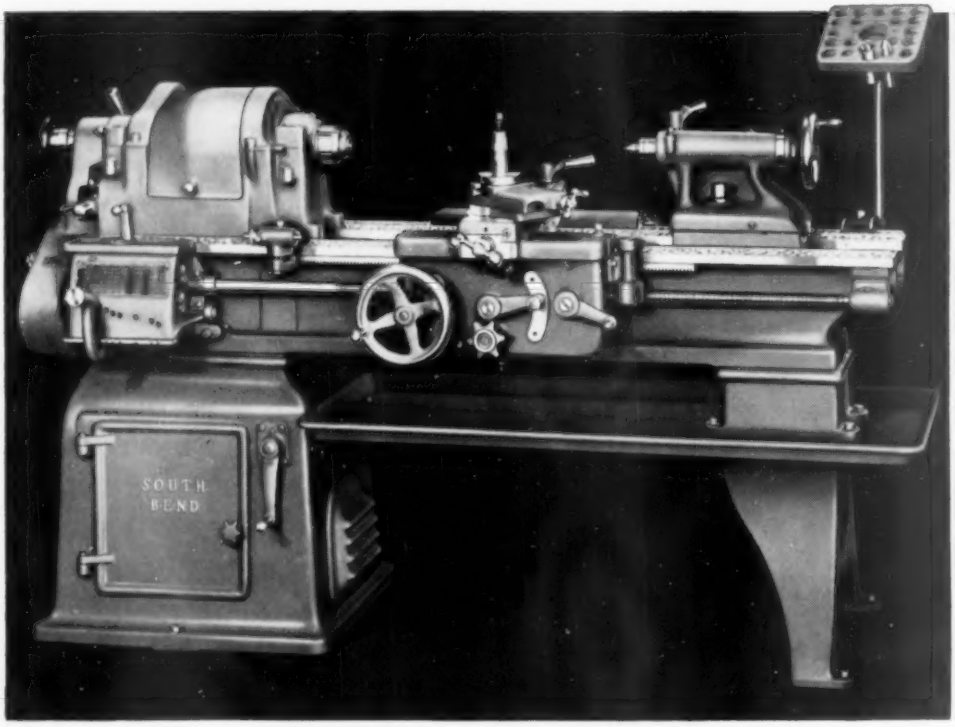
NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE • ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

2526

SOUTH BEND 16" PRECISION LATHES



16" x 6' South Bend Precision Toolroom Lathe **$1958.00**

PROMPT DELIVERY

Immediate delivery of some models from distributors' stocks. Others available for early factory delivery.

PRICES

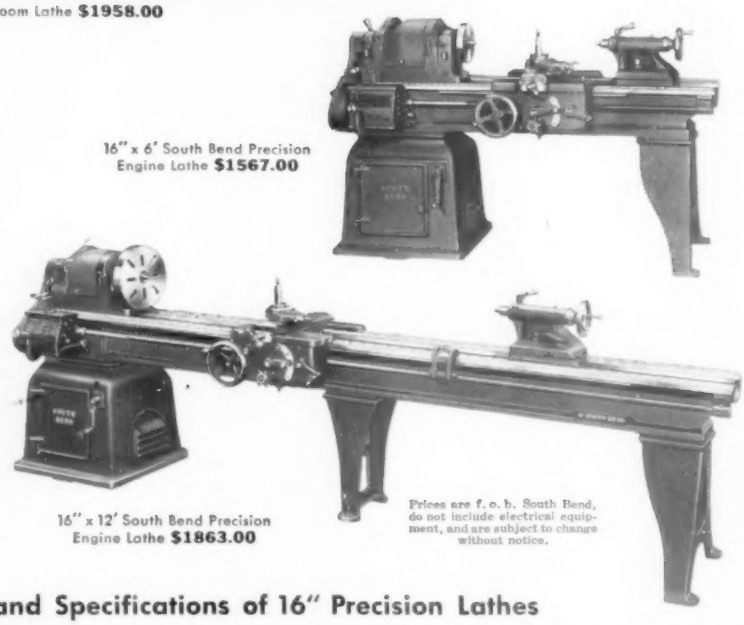
South Bend Lathes now represent a greater value per dollar of cost than ever before. The average price increase over prewar level is less than 15%.

TIME PAYMENTS

South Bend Lathes and accessories are available on Time Payment Terms. 25% down—12 mo. to pay. Moderate finance charge.

The accuracy and versatility of South Bend 16-inch Swing Lathes improve the quality of toolroom work, facilitate tooling, and save machining time. Toolmakers like them. These same features — plus their large capacity, ease of operation, and dependability—step up production work. All these advantages make possible the manufacture of better products at lower costs.

In addition to the lathes shown, South Bend Engine Lathes and Toolroom Lathes are available with 9", 10", 13", and 14½" swings. Also Precision Turret Lathes with ½" and 1" maximum collet capacities. Write for catalog, stating the size lathe in which you are interested.



16" x 6' South Bend Precision Engine Lathe **$1567.00**

16" x 12' South Bend Precision Engine Lathe **$1863.00**

Prices are f. o. b. South Bend, do not include electrical equipment, and are subject to change without notice.

Features and Specifications of 16" Precision Lathes

Toolmakers like them

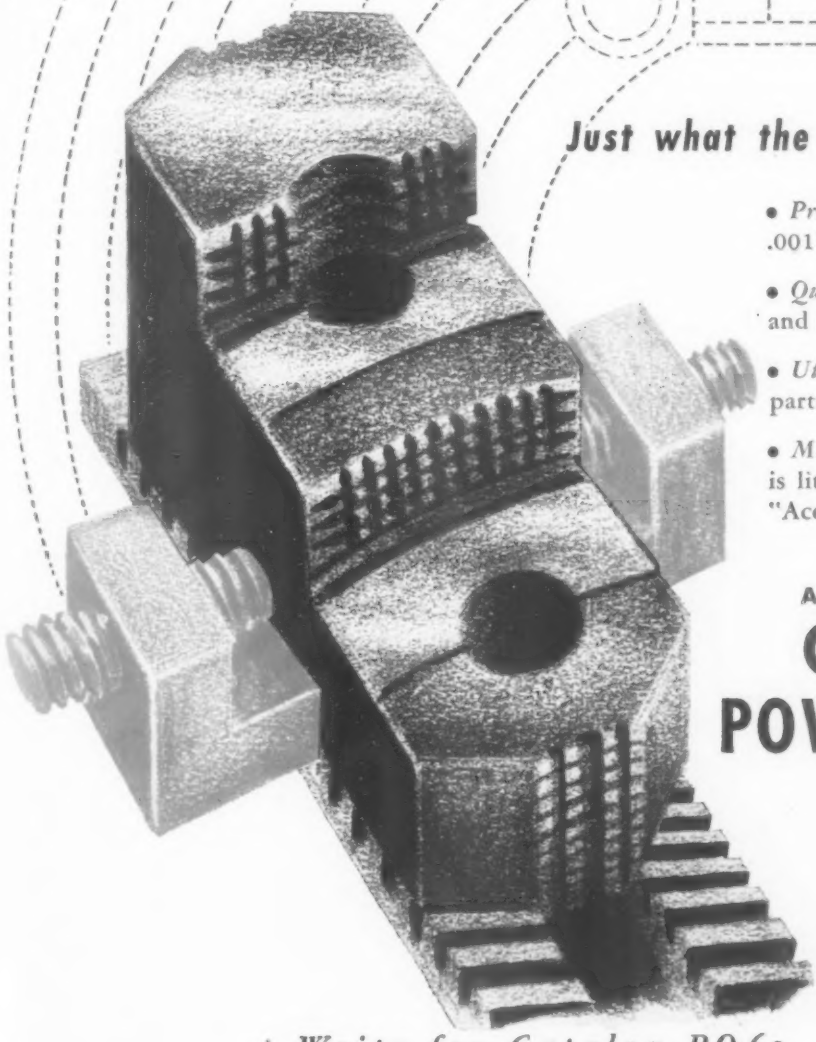
Swing Over Bed and Saddle Wings	16¼"
Swing Over Saddle Cross Slide	9⅝"
Bed Lengths	6, 7, 8, 10, and 12 feet
Distance Between Centers	33½" to 105½"
Spindle Speeds (8)	21 to 725 r. p. m.
Power Longitudinal Feeds (48)	.0015" to .0841"
Power Cross Feeds (48)	.0006" to .0312"
Thread Cutting (48 pitches)	4 to 224 per inch
Maximum Collet Capacity	1"
Spindle Bore	1⅜"
Cross Slide Travel	10½"
Compound Rest Top Slide Angular Feed	3¾"
Tailstock Spindle Feed	5¾"
Tailstock Top Set-Over	1"

BUILDING BETTER LATHES SINCE 1906

SOUTH BEND LATHE WORKS

531 EAST MADISON STREET • SOUTH BEND 22, INDIANA

CUSHMAN "ACCRALOCK"



Just what the name implies

- *Precision* in jaw adjustment to within .001" concentricity.
- *Quick, positive lock* with the safety and rigidity of a solid jaw.
- *Utmost simplicity* with few sturdy parts.
- *Maintained accuracy* because there is little or no wear in operation of "Accralock" units.

An exclusive feature of

CUSHMAN POWER CHUCKS

Write for Catalog PO62

THE CUSHMAN CHUCK COMPANY, HARTFORD 2, CONNECTICUT

Presenting THE NEW DESIGN "OOG" AND "OG" AUTOMATIC SCREW MACHINES

IMPROVEMENTS AND REFINEMENTS have been made in these Automatic Screw and Automatic Cutting-Off Machines to increase their efficiency and to permit the maintenance of closer limits, finer finish and more uniform production.

Spindle is positively driven at all speeds and is provided with 196 two-speed combinations including a wide range of high to low speed ratios. This wide selection of ratios makes possible the use of correct speeds for threading without limiting the selection of efficient high speeds for forming, drilling and similar operations. Equal cutting efficiency is obtained on all materials ranging from tough alloy steels to free-cutting plastics and on the widest range of work diameters.

Numerous design and construction details combine to shorten set-up time and a wide assortment of available attachments further increases overall value in terms of investment. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

NO. OOG CAPACITY . . .
Takes stock to 3/8" diameter. Turning capacity to 3/4".

NO. OG CAPACITY . . . .
Takes stock to 5/8" diameter. Turning capacity to 1 1/4".

BROWN &

Featuring

196 two-speed combinations of spindle speeds with positive chain drive to spindle

BROWN & SHARPE
OOG AUTO. SCREW MACHINE SPINDLE SPEEDS

SPINDLE SPEEDS IN R.P.M.	RATIO CHANGE GEARS	UPPER / LOWER	LOW SPEED	OPPOSITE DIRECTION FRONT	SAME DIRECTION REAR
6050	28 31 35 39 42 46 49 53 56 60 64 67 70 73				
4230	67 64 60 56 53 49 46 42 39 35 31 28 25 22				
73-22	6050 3780 3255 2786 2385 1990 1680 1440 1240 1025 920 765 660 665				
70-26	5110 3180 2745 2288 2015 1680 1428 1250 1055 930 778 645 555				400
67-29	4385 2345 1956 1630 1435 1198 1005 900 790 665 550			440	345
64-31	3770 2345 1696 1416 1225 1045 920 780 685 575			410	350 295
60-35	3130 1956 1588 1178 1028 870 765 648 565			395 340	290 245
56-39	2870 1638 1418 1178	860 725 640 540		400 330	285 245 205
53-42	2385 1435 1240 1038 860	640 565		420 360	290 250 215 180
49-46	1945 1218 1045 865 725 640		400 350	295 245	210 190 165
46-49	1715 1085 920 765 640 560		355 310	260 220	185 160 135
42-53	1450 900 780 645 540	400 355	260 220	185 160	135 115
39-56	1270 790 680 565	415 360 310 260	195 160	125 120	100
35-60	1085 660 570	385 350 295 250 220 195	135 115	100	85
31-64	885 550	395 330 290 245 215 185 160 135	100	85	70
28-67	765	415 340 295 250 210 185 160 140 115 95		70	60
25-70	650 405 350 290 245 215 180 160 135 120 100 80		70		50
22-73	560 345 295 245 205 180 155 135 115 100 85 70		60	50	
Ratio of High to Low Speed	1.6 1.8 2.2 2.6 3 3.6 4.1 5 5.5 6.5 7.9 9.1 11 13				

SPINDLE RUNNING FAST — BACKWARD — FORWARD — CROSS — OPEN — DRIVING SHAFT BELT

*THESE COMBINATIONS NOT TO BE USED IN OPPOSITE DIRECTIONS

196 TWO-SPEED COMBINATIONS

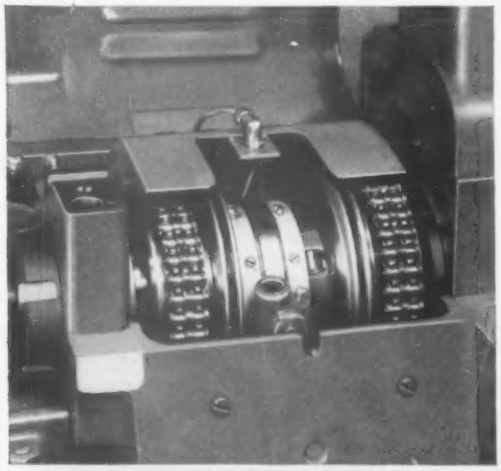
are provided with a range from 6050 to 50 R.P.M. on the "OOG," and a range of 4230 to 35 R.P.M. on the "OG." Approximate ratios of high to low speeds range from 1.6:1 to 13:1 except for highest and lowest high speeds where ratios range from 1.6:1 to 11:1.

HIGH SPEEDS EASILY CHANGED

by one pair of pick-off gears. Gears quickly withdrawn from splined shafts by loosening clamp nuts, releasing washers. Replaced by another set from storage compartment in door. One set of 16 gears provides not only 16 high speeds, but also all ratio changes.

LOW SPEED RATIO AND DIRECTION

equally easy to change. Selecting the direction of low speed is done merely by placing lower of two change gears on proper one of two centers. Driving sprockets and spindle driving chains remain untouched.



CHAIN-DRIVEN FULL-ANTIFRICTION-BEARING SPINDLE

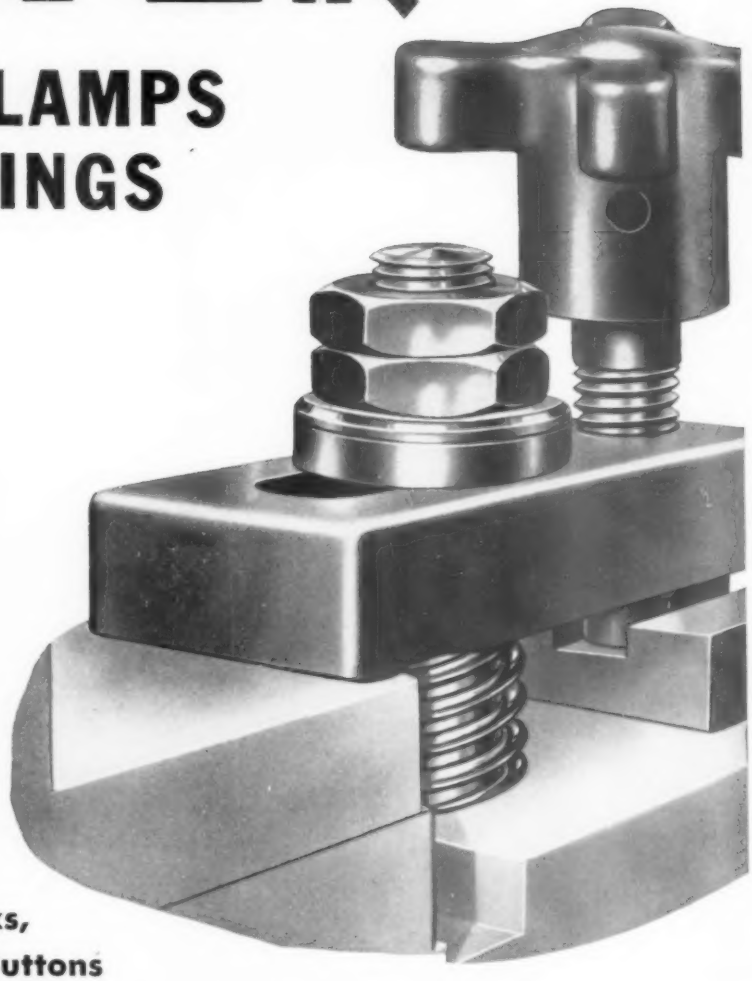
Positive drive of spindle by roller chains at all speeds insures required power throughout full range of operations within capacity of machine. Spindle readily removable. End thrust is taken by preloaded, precision ball bearings.

SHARPE

B·S

SIEWEK

FIXTURE CLAMPS AND FITTINGS



Immediate Delivery

from stock of all Siewek Jigs, Clamps and Fittings is now possible from these strategically located firms:

Paul B. Slater Co., 1025 Santa Fe Avenue, Los Angeles, Calif.

H. Colby Rowell Co., 2447 Nicollet Avenue, Minneapolis 4, Minn.

Fink Tool Co., 898 Clinton Ave. S., Rochester 7, New York

H. E. Scholey, 2603 N. Main, Dayton, Ohio

Jack Locks, Fixture Locks, Cams, Knobs, Rest Buttons

Clamp assemblies and other parts necessary for the construction of special fixtures make up this standard Siewek line.

The Clamp assemblies themselves are made in 24 different types, most of them in three sizes. In other words, there is a type and size to meet the requirements of practically all shops.

The necessity for uniform, right angle pressure for secure holding is recognized and is provided for in every SIEWEK Clamp. Clamp bars and every other part are made to last for years—with a liberal factor of safety.

Tell us what your requirements are. We will gladly supply full information on the type of clamp or part to use. *Immediate delivery!*

Write for full size template drawings for use in layout work.

Also Manufacturers of Siewek Rapid Clamping Jigs and Details

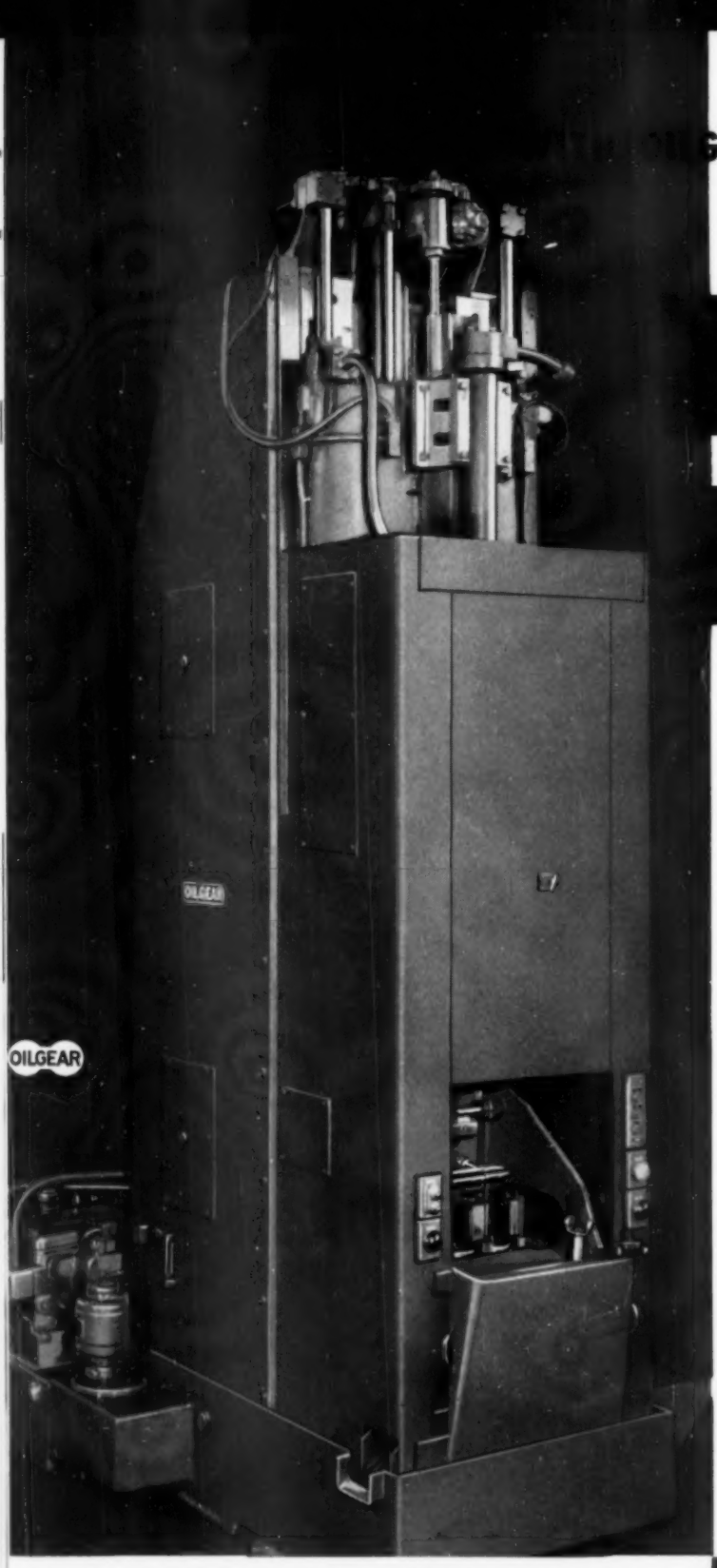
SIEWEK TOOL COMPANY

2862 E. Grand Boulevard, Detroit, Michigan

Distributors in Principal Cities

Branch Offices:

HARTFORD Siewek Tool Co., 119 Ann St., Phone 6-7617, Hartford 3, Conn.
CHICAGO Siewek Tool Co., 224 S. Michigan Ave., WABash 5509, Chicago 4, Ill.



GEAR NEW VERTICAL CYCLEMATIC BROACHING MACHINES . . .

Holes broached in valve rocker arms 1200 per hour

17 splines broached in universal joint yokes 500 yokes per hour

Work loaded during broaching stroke.
Automatically positioned, threaded, broached, and ejected.

The *unique* Oilgear Vertical Cyclematic Broaching Machine is a *high production* unit. Typically, it finish-broaches 17 splines in universal joint yokes at the rate of 500 pieces per hour, using 3 tools; it finish-broaches holes in valve rocker arms at an average rate of 1200 pieces per hour, using 6 tools. These valve rocker arms are loaded during the broaching stroke.

Work is loaded at a convenient level. Positioning, threading, broaching and ejecting work are entirely automatic. The usual operations, pilot and control valves and other parts that confuse and tire the operator are eliminated. Full manual control of the cycle is provided for test and set-up purposes.

Work table and all controls are designed for utmost ease and convenience to the machine attendant. Dual safety start buttons, emergency stop button, cycle selector and tool positioning controls are all located in easy reach. Famous Oilgear two-way variable displacement pumps provide variable broaching speeds up to 30 f.p.m. and independently variable return speeds up to 80 f.p.m.

Full pressure lubrication of work and tools is continuous and automatic during the broaching operation and forces chips to fall away immediately. Tools are rigidly secured at both ends during the critical portion of the stroke, eliminating vibration and minimizing drift.

The Cyclematic sets on its own base and requires no special foundation or pit. It can be made a part of a production line without costly preparations and without disrupting operations. Work table height conforms to usual conveyor working level. THE OILGEAR COMPANY, 1308 W. Bruce Street, Milwaukee 4, Wisconsin.

Oilgear Fluid Power
BROACHING MACHINES

MAIL COUPON FOR NEW BULLETIN

The Oilgear Company
1308 W. Bruce St., Milwaukee 4, Wis.

Please send me a free copy of Bulletin 22001 on the New Vertical Cyclematic Broaching Machines.

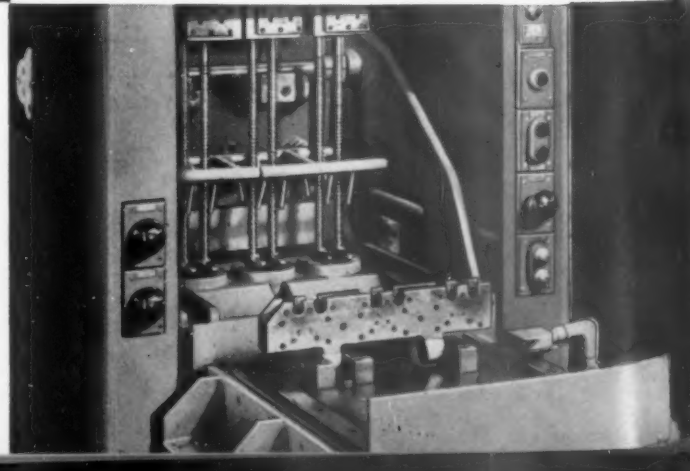
Name _____

Position _____

Company _____

Address _____

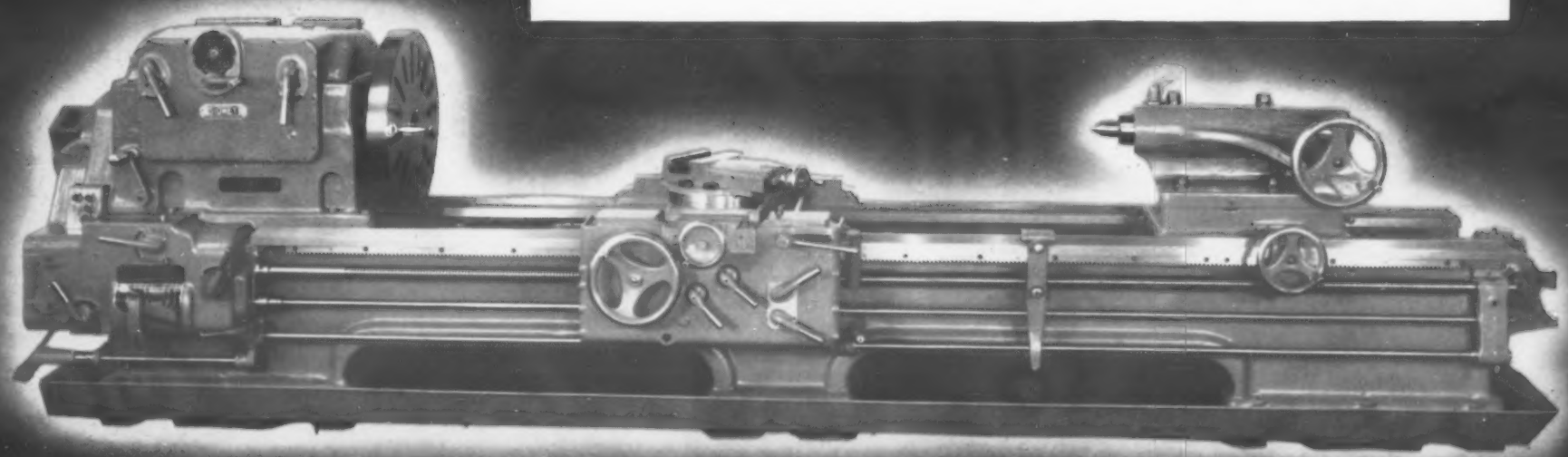
City _____ *State* _____



Sidney Lathes

● Power is evident in the massive, heavy construction of this Sidney 32-inch lathe. However, this illustration does not reveal the smooth flow of power and freedom from back lash developed by the Sidney Continuous Type Herringbone Geared Head—an exclusive feature pioneered and brought to its present efficiency by Sidney engineering. Here is a lathe capable of using carbide tools to their fullest efficiency. Add to this a wide range of feeds and speeds—operation made easy by centralization of controls—accuracy of work assured on all operations—and you have a dependable machine for your precision turning, facing, counterboring, threading, and similar operations.

Bulletins on all sizes available.



SIDNEY MACHINE TOOL COMPANY · SIDNEY, OHIO

Builders of Precision Machinery Since 1904

INGERSOLL FACE MILL CUTTERS

Available from Stock

TYPE NX Heavy Duty Series face milling cutters designed for geneal purpose work are suitable for taking ½" cuts on both the face and periphery in cast iron or steel. Serrated high speed steel blades are locked in the cutter housing by wedges and screws. Chip clearance is milled in the housing to prevent chips clogging on heavy cuts. The following sizes are available in stock both right and left hand.

Cutter No.	Diameter	No. Blades	Cutting Face on Periphery	Price
8104X	4"	10	1-¾"	$30.00
8106X	6"	10	2-½"	35.00
8108X	8"	14	2-½"	45.00
8110X	10"	18	2-½"	60.00
8112X	12"	20	2-½"	78.00

SHEAR CLEAR Heavy Duty Series face milling cutters will out-perform any existing designs for work in tough steel and in the soft, stringy, non-ferrous metals. Designed for ½" deep cuts. The Shear Clear is a patented design using steep negative rake and positive shear angles which cause chips to coil outward away from the cutter. The following sizes with high speed steel blades are available in stock both right and left hand:

Cutter No.	Diameter	No. Blades	Price
7106X	6"	12	$58.00
7108X	8"	16	75.00
7110X	10"	20	100.00
7112X	12"	22	120.00

Write for Catalog 55C giving complete details on inserted blade milling and boring tools.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

WOODWORTH GAGES *ACCEPTED* BY ALL INDUSTRY . . . . . !

GREEN—GO

RED—NOT GO

Industry by industry—coast to coast—wherever accuracy and durability count—Woodworth Company is winning and holding new friends—with the *ACCEPTED ADJUSTABLE THREAD RING GAGE.*

ACCURACY YOU CAN TRUST

SEND FOR—The new 1948 Woodworth Gage Catalog just off the presses. Requests for copies must be written on company letterheads.

★There's a Woodworth representative near to serve you. Write us for his name.

WOODWORTH

N. A. WOODWORTH CO., 1300 EAST NINE MILE ROAD • DETROIT 20, MICHIGAN

COMPLETE LINE OF PRECISION GAGES • DIAPHRAGM CHUCKS • CONE-LOK JIGS

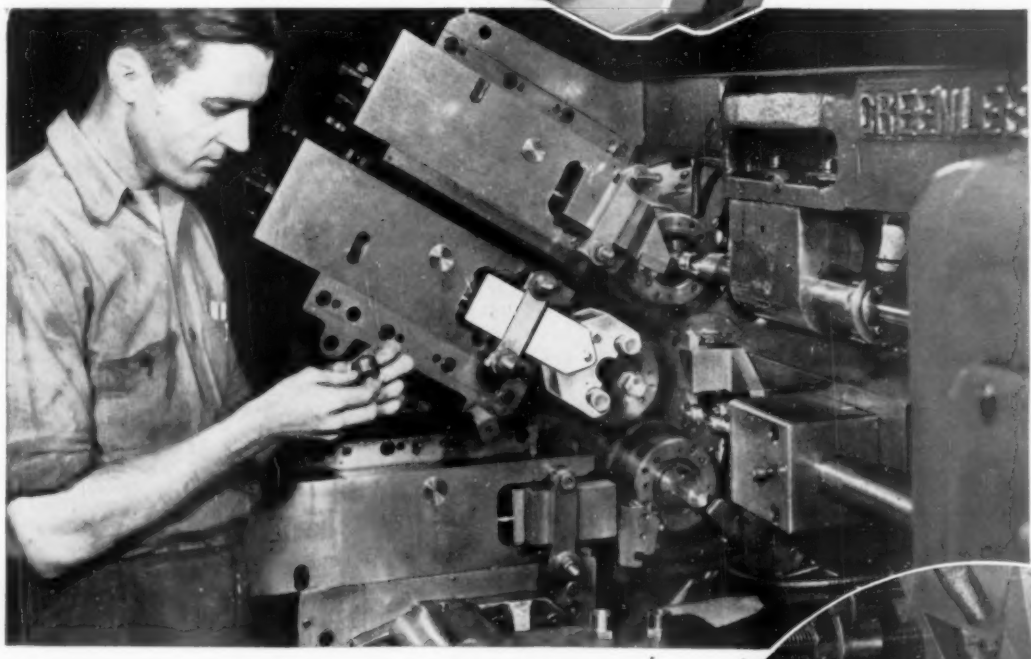

Pre-formed
CARMET CARBIDE
Inserts for
Blanking Dies
Do you have a
"Problem" Part?
Make it of
CARMET
The Carmet-insert die produces 20 times more silicon steel blanks before grinding than the die it replaced. Figure the down-time saved, then figure where you can use such superior wear-resistance. We preform Carmet sintered carbides to almost any shape or size—supply them finish-ground, too, if you wish. • Call us in on your problem parts—and don't forget Carmet Tools for best results on your cutting operations.
ADDRESS DEPT. TE-59
Allegheny Ludlum Steel Corporation

ANNOUNCING

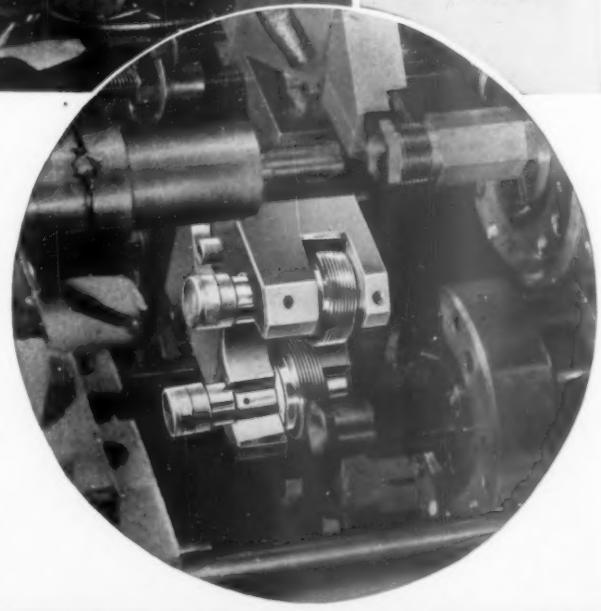
THE NEW LANDIS LANROLL ATTACHMENT

For Rolling Straight Threads

This newest development, designed for Automatic Screw Machines and Turret Lathes, further enlarges the Landis Line of equipment for all types of threading jobs—thread cutting, thread grinding, and thread rolling.



The No. 18 Lanroll Attachment illustrated is being used on an Automatic Screw Machine to roll threads on Steel Bushings. The use of the Lanroll Attachment eliminates producing the thread as a separate operation. The thread is rolled as it is formed —thus, the bushing is completely machined in one handling.



Thread rolling is a fast and economical method of generating screw threads. Inaccessible positions for normal die head threading or shoulder interference usually require processing these threads as a secondary operation. The LANROLL Attachment allows the work to be completed in the same chucking, thus cutting costs and providing closer tolerance between the thread and other parts of the work.

The LANROLL Attachment offers considerable advantages over the type commonly used in the past on automatic machines. The largest diameter rolls permissible provide the most efficient rolling action. A set of two rolls effects a reduction in the feed load. Thus smaller diameters can be rolled, and in positions somewhat extended from the work-holding chuck support.

LANDIS MACHINE COMPANY

WAYNESBORO · PENNSYLVANIA · U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

EXTRA PROFITS COME FROM GROUPING OPERATIONS

ONE operator handles both drilling and tapping at almost DOUBLE the production formerly obtained by TWO operators

Two operators drilling and tapping separately 6 holes, 7/64" in diameter, were producing 1500 to 1800 completed die cast parts an hour.

By grouping the two operations on one simple, inexpensive, tool-room-built unit, fed by Bellows "Controlled-Air" Powered Feeds (electrically synchronized) one man performs both operations and obtains almost double the production — 2500 to 3000 complete pieces per hour.

Multiple operations on the same work piece can often be grouped and handled automatically with inexpensive tool-room-built special purpose machines made by combining standard machine tool units with Bellows "Controlled-Air" Power Feeds.

Bellows "Controlled-Air" Power Feeds advance work or tools a pre-determined distance, under a pre-determined thrust. Traverse speeds are independently controlled and are adjustable to any desired degree. As many as fourteen electrically-controlled Bellows Feeds may be synchronized to operate automatically with a single work holding fixture.

Write Today

Write today for the new 16 page booklet and the Foto Facts File showing typical installations of Bellows "Controlled-Air" Power Devices. No cost, no obligation.

The Bellows Co.

AKRON, OHIO

An 8-hour day's work finished in 49 minutes

The Campbell-Hausfeld Co. of Harrison, Ohio, large manufacturers of Air Compressors, have been able to accomplish in less than one hour what they formerly did in one 8-hour working day. U. S. Drill Head Co. made this possible!

This photograph shows a drilling head complete with boring bars with Carboloy tipped cutters and Stellite wear strips. The five-position indexing table has necessary holding fixtures with bushing guide plate suspended from head, locating over hardened dowel pins in each position in the fixture.

Operation: Semi-finish cylinder bore to 1.373—1.3735" for honing operation.

Production: 90 pieces per hour 85% efficient.

Machine operates as follows enlarging 1¼" cored hole to 1.373" diameter:

Station #1: Unload and load one piece.

Station #2: Rough bore two cylinder holes.

Station #3: Rough bore two cylinder holes to 1.340" diameter.

Station #4: Semi-finish two cylinder bores.

Station #5: Semi-finish two cylinder bored to 1.373-1.3735" diameter.

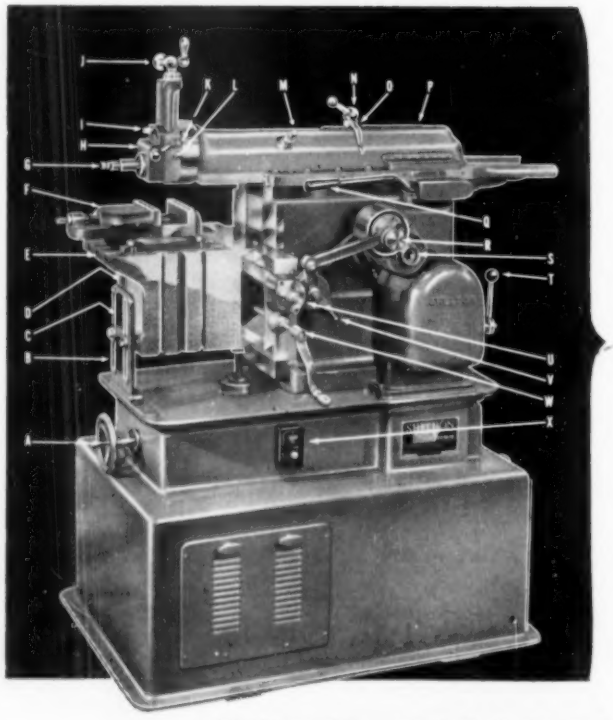
This allows only .002—.0015" stock to be removed by honing machine, which formerly had to be .006" to .007" due out of roundness of holes; thus cutting time for this operation.

US HEADS SINCE 1915

Also manufacturers of all types of fixed center heads.
WRITE TODAY for descriptive catalogs.

UNITED STATES DRILL HEAD CO.

CINCINNATI 4, OHIO

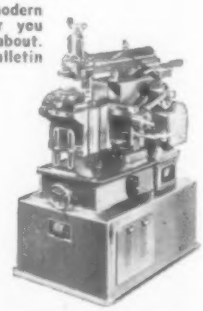


SHELDON Vernon

No. 8000 12" Shaper

A Variable Speed Hand Wheel
B Table Support
C Table Protractor (not shown)
D Cross Rail Lock
E Table
F Vise
G Tool Holder
H Clapper Box
I Clapper Box Lock
J Tool Slide Handle
K Tool Slide Lock
L Tool Slide Swivel Lock
M Ram Positioner
N Ram Clamp
O Stroke Indicator
P Ram
Q Clutch
R Feed Adjustment
S Shaft for Adjusting Length of Stroke
T Back Gear Lever
U Cross Feed Screw
V Feed Direction Control
W Elevating Shaft
X Motor Switch

Here is a modern quality shaper you should know about. Write for Bulletin 547B.



Engineered to meet today's demand for close tolerance work at a wide range of speeds . . . for a compact, easy to operate shaper that is sturdy enough for production use, still accurate enough for the tool room . . . for a capable full sized (1800 lb.) shaper at a low price.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4229 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

RACINE HYDRAULICS

Racine Variable Volume Oil Hydraulic Pump with solenoid operated 2-pressure control. These pumps supply the power for shearing, punching and trimming spring leaves that are fabricated by this press. Fifty foot bars are fed into one end of the press. A complete spring is fabricated on each cycle.

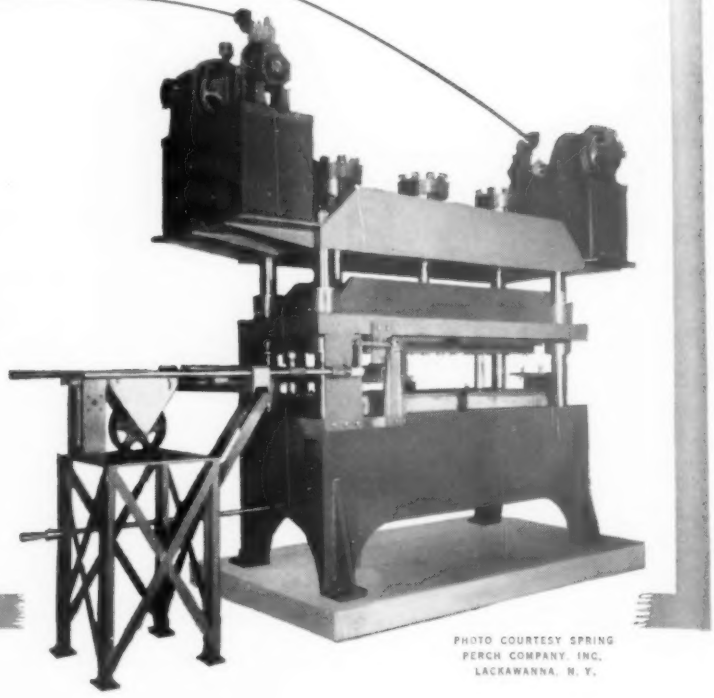


PHOTO COURTESY SPRING PERCH COMPANY, INC. LACKAWANNA, N. Y.

Smooth Oil-Cushioned Action Under Variable Volume Control

The built-in Variable Volume feature of RACINE Pumps simplifies your hydraulic circuits, reduces piping and eliminates the use of relief and by-pass valves. Your machine runs shock-free, cool and uses less horsepower. Aggregate cost of complete hydraulic assembly is substantially reduced.

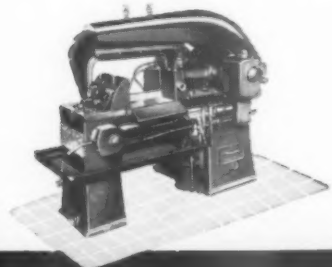
RACINE users now include manufacturers of Presses, Die Casting and Plastic-Molding Machines, Drilling and Woodworking equipment, Lifts, Elevators and many additional types of machines. An impressive number have standardized on RACINE's full line of Variable Volume pumps, Sleeve Type valves and Hydraulic pressure boosters.

Let us prepare for you, a full outline of the special advantages your product can present when RACINE Hydraulic Equipment is used. Make our Variable Volume feature a part of your machine. RACINE hydraulic engineers will give you full cooperation without cost or obligation. Write today for our Free catalog P-10-C. RACINE TOOL AND MACHINE COMPANY, 1774 State St., Racine, Wisconsin.

Racine Hydraulic

METAL CUTTING MACHINES

Featuring open front design—simple one lever control—smooth oil-cushioned progressive feed. Cut any metal from light tubings to structural shapes and billets of tough tool steels. Models in all price ranges. Capacities 6" x 6" to 20" x 20". Write for complete catalog No. 12.



RACINE

STANDARD FOR QUALITY AND PRECISION

Talide
(TUNGSTEN CARBIDE)
Performance!

Hardest man-made metal.

Highest modulus of elasticity.
(double that of steel)

Extreme Density.

Low coefficient of expansion and contraction.

High compressive strength.

High red hardness.

On any application involving cutting tools, drawing dies, or wear parts in your plant, you can up your production many times over by using Talide Tungsten Carbide.

For example, cutting tools of Talide cut 2 to 3 times faster than high speed tool steel. Likewise dies and wear resistance parts outwear steel by as much as 50 to 1. Use Talide Metal wherever steel parts wear too fast or service is too severe for steel.

Properly applied, Talide Metal's original cost is no factor as proved by experience of the past 15 years in all types of industrial applications. Let our sales engineers give you full particulars and recommendations.

Send for catalogs on Talide Tools, Dies, and Wear Parts.

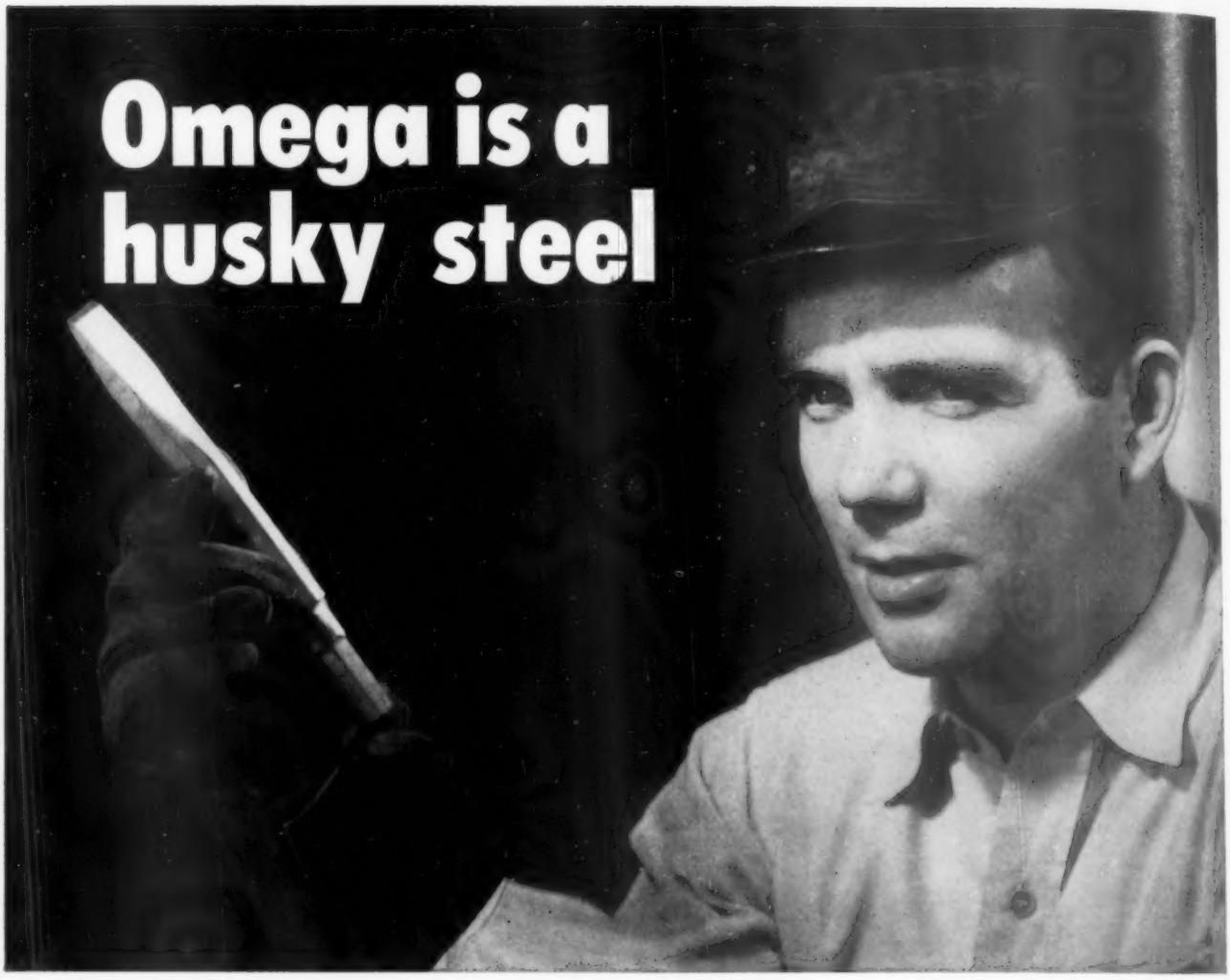
SINTERED CARBIDES
METAL CARBIDES CORPORATION
MC
TALIDE
YOUNGSTOWN, OHIO
HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

Omega is a husky steel



Here's a tool steel that thrives on cold-battering jobs. Omega keeps a sharp cutting edge and takes hard knocks in its stride. It's super-resistant to shock. That's why it's popular for applications like these:

Chipping chisels	Beading tools
Shear blades	Punches
Calking tools	Forming rolls
Rivet busters	Swaging dies

When the job calls for drastic, repeated impacts at normal temperature, Omega is your best choice. It is essentially a silico-manganese steel, combining ductility, high tensile strength, and hardness. Give it a trial—as rough as you want. You'll like the way Omega stands up.

The nearest Bethlehem district office or tool-steel distributor can give you complete details.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem Products are sold by Bethlehem Pacific Coast Steel Corporation

QUICK FACTS ABOUT OMEGA

- **Harden it in either oil or water.**
- **Easy to forge, machine, heat-treat.**
- **58-60 Rockwell C normal working hardness.**
- **In its maximum heat-treated condition, its resistance to impact, using Charpy unnotched specimen, is approximately 130 foot-pounds.**
- **Typical Analysis:**

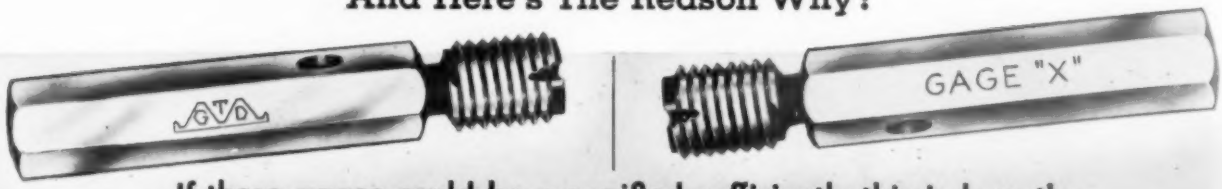
C	Mn	Si	V	Mo
0.60	0.70	1.85	0.20	0.45

BETHLEHEM STEEL

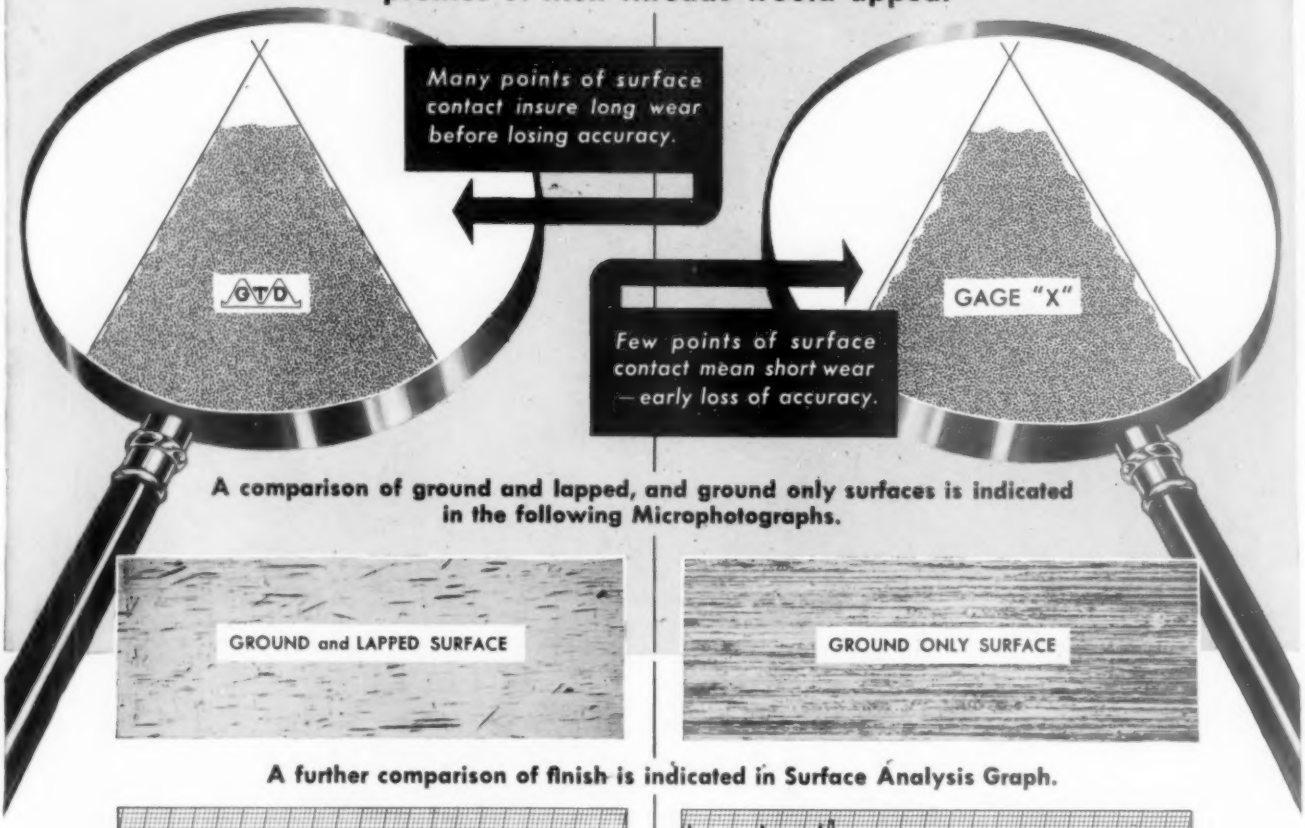
OMEGA... one of Bethlehem's Fine Tool Steels

They Look Just The Same, BUT....

The "Greenfield" Gage Will Outwear Gage "X" Many Times. And Here's The Reason Why!

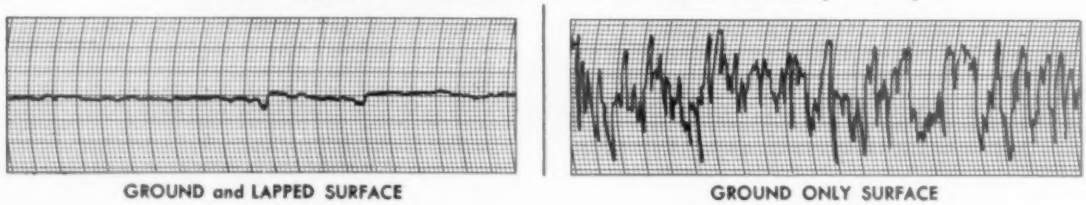


If these gages could be magnified sufficiently this is how the profiles of their threads would appear



A comparison of ground and lapped, and ground only surfaces is indicated in the following Microphotographs.

A further comparison of finish is indicated in Surface Analysis Graph.



GROUND and LAPPED SURFACE — GROUND ONLY SURFACE

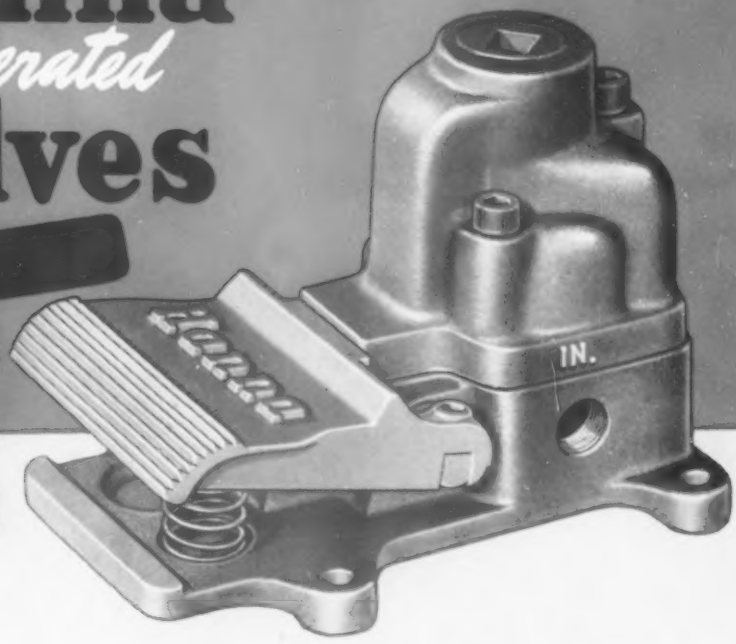
Both gages will pass all measurement requirements. But the "Greenfield" Gage, because of its finely lapped surface, will outwear the other many times. *All* "Greenfield" Gages are lapped to an extremely high degree of finish. This "inbuilt" extra wear which gives long and accurate service and better value to users, is one reason for "Greenfield's" reputation in the gage field. *For better gaging, "GO" Greenfield.*

GTD Greenfield 75th YEAR

GREENFIELD TAP and DIE CORPORATION · Greenfield · Massachusetts
and its New Haven Division The GEOMETRIC TOOL COMPANY

free busy hands with Hanna foot operated Valves

simple, effortless control of air and hydraulic cylinders

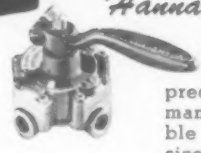


By eliminating the use of hands in the control of air and hydraulic cylinders, Hanna Foot Operated Valves reduce operator fatigue and increase operating efficiency. The operator's hands are free to concentrate on feeding or handling work pieces, thereby enabling him to do his job better and faster with the same amount of effort.

Hanna Foot Valves are available in single and double pedal models in ⅜", ½", ¾" and 1" pipe sizes for use with double acting air or oil hydraulic cylinders. They are good for pressures to 250 psi. air or oil.

Ask for your copy of the new catalog No. 235 which gives operating data and dimensions of all Hanna Valves.

Check these other Hanna Control Valves



UNITITE VALVES are of the packless type, precision built and permanently tight. Available in a wide range of sizes for use as 3- or 4-way air, oil or water valves.

UNITITE JR. VALVES are smaller capacity companions of the standard Hanna Unitite Valves.

SPEED CONTROL VALVES provide adjustable control of inflow as well as outflow of air or oil independently to and from one side of the cylinder piston.

Catalog 235 describes all these valves as well as foot-operated models.

Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

1765 Elston Avenue, Chicago 22, Illinois

Ampcoloy machine part outwears steel 20 times — drastically reduces maintenance and down time

Working against molten metal under high pressure is a tough job for any machine part. It's a job that wore out hardened steel plunger-tips in a die-casting machine every four or five days. But when Reynard Industries, Inc. specified wear-resistant Ampcoloy tips — they increased part life 20 times, prevented seizure and galling of cylinder wells (and the frequent honing previously required), and eliminated expensive graphitic lubrication which often discolored and spoiled castings.

This is a typical example of advantages you gain from wear-resistant Ampcoloys and Ampco Metal, the modern aluminum bronze. Use durable Ampco bronze parts in your own products as a selling feature. Look for them in equipment as a mark of quality when you buy. And replace worn parts in your present machines with Ampco alloys to reduce replacement frequency and slash maintenance costs.

Order Ampco Metal and Ampcoloys in centrifugal- and sand-castings, extrusions or forgings, according to your requirements. Let your nearby Ampco engineer help you select the proper grade for your needs. For more information about Ampco Metal and Ampcoloys, write for bulletins today!

Ampco Metal has 7 outstanding performance advantages—

Excellent bearing qualities • High strength-weight ratio • High compressive strength • High impact and fatigue values • Corrosion resistance • Wear resistance • Efficiency at extreme temperatures.

REG. U. S. PAT. OFF.

AMPCO

Ampco Metal, Inc.

Dept. TE-11 • Milwaukee 4, Wis.

Field Offices in Principal Cities

AD-33

UNIVERSAL adjustable collet chuck eliminates drilling of bell-mouthed holes

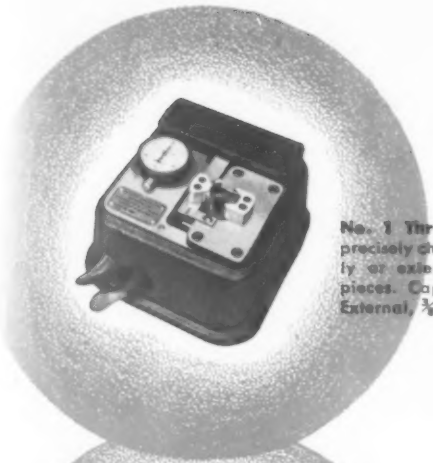
Now you can perform drilling and reaming operations on your screw machines *without the danger of taper or bell-mouthed holes.* Use the Universal Adjustable Collet Chuck that provides *quick adjustment for angular misalignment in any direction.*

Drive is carried through the internal cross key center driver which is keyed at right angles to both shank and nose piece. *A screw permits adjustment in each direction.* A line scribed across the segments of the 3-piece driver makes alignment quick and easy and shows instantly the approximate amount that chuck is off center. When precision accuracy is required, flats may be indicated.

Four adjusting screws at the side of the Universal Adjustable Collet Chuck permit *correction of angular misalignment in any direction.* Clamping screws lock the tool firmly in position after it is entered in correctly located holes. For complete information, write your nearest Universal warehouse—89 Main St., Ansonia, Conn., or 5629 Sixth St., Kenosha, Wisc. — or write direct to our home office.

UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND EFFICIENCY IN YOUR PLANT

UNIVERSAL ENGINEERING COMPANY • **FRANKENMUTH, MICHIGAN**



No. 1 Thread Gage for precisely checking internally or externally threaded pieces. Capacity $\frac{3}{16}$" to 1" External, $\frac{3}{8}$" to 1" Internal.

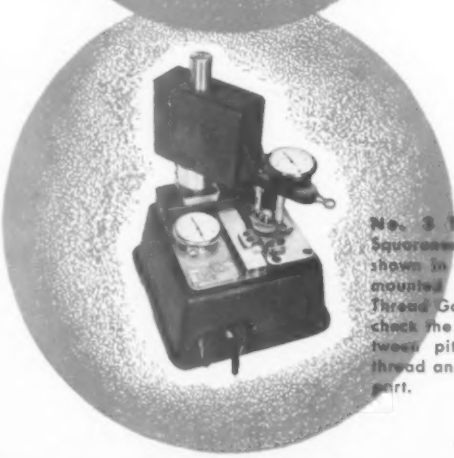
Bryant Gages

offer **Faster, Simpler, Highly Accurate Visual Inspection of Threads & Holes**

No. 2 Adjustable Thread Gage for economically inspecting a wide variety of externally threaded parts with diameters on the same pitch. Capacity 1" to $2\frac{1}{2}$".

The brand new principle embodied in Bryant Gages provides a faster, simpler, highly accurate means for visually inspecting internally or externally threaded pieces and internal or external plain diameters. The Bryant method employs three precision ground contact points and visual accuracy indication. Bryant gages are so simple to operate that virtually no time is required for acclimatization. All the operator need do is squeeze the control lever, place a part in contact with the segments, give it a third of a turn in the case of threaded pieces, and check overall accuracy on the large dial indicator. Where squareness of face is an important factor, a movable arm carrying two contact points and a large dial indicator which records squareness of face may be added.

Universal Diameter Gage for inspection of internal or external plain diameters from $\frac{3}{8}$" to 4".



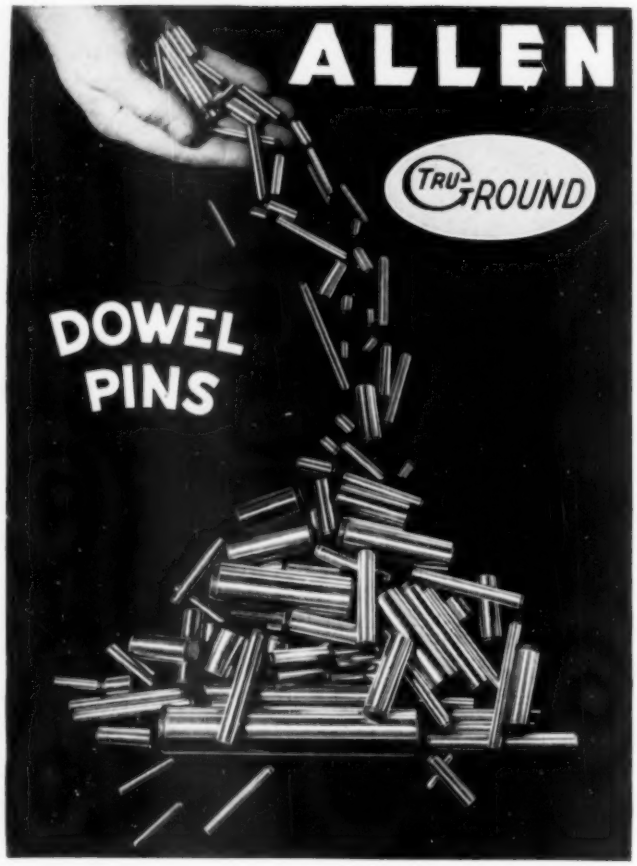
No. 3 Thread Gage. Squareness of Face Gage, shown in position, can be mounted on any Bryant Thread Gage to accurately check the relationship between pitch diameter of thread and the face of the part.

Internal Portable Thread Gage for checking heavy work or parts still mounted in the machine. Capacity No. 1 Gage, $\frac{7}{16}$" to 1"—No. 2 Gage, 1" to 3".

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT



Your local Industrial Distributor has these locating pins for the diemaker's work, —which also serve as perfect shafts for pins and pivots in various machine assemblies.

Accurate to a limit of .0002" over basic size, with allowable tolerance of plus or minus .0001". Ground, polished surfaces, treated with rust-preventive. Heat-treated to an extremely hard exterior, with core of the right hardness to prevent "mushrooming" when driven into a tight hole. Tensile strength 240,000 to 250,000 p.s.i. Steeled to *retain* precision standards in tool and die work; special-analysis ALLENOY steel used exclusively.

Write us for samples and dimensional data to indicate the wide range of uses for these *TRU-GROUND* Pins. Order from your Allen Distributor's warehouse stock.

THE ALLEN MFG. COMPANY
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FOR LABORATORY, TOOL ROOM OR PRODUCTION LINE TESTING

For 27 years, Wilson has kept pace with—even anticipated—the needs of Industry in hardness testing equipment. There has been constant improvement in existing instruments and development of new ones to meet more exacting requirements.

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MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
230-H PARK AVENUE, NEW YORK 17, N. Y.

ACCO
A·C·C
TRADE MARK

Roastin' Ears too, demand it...

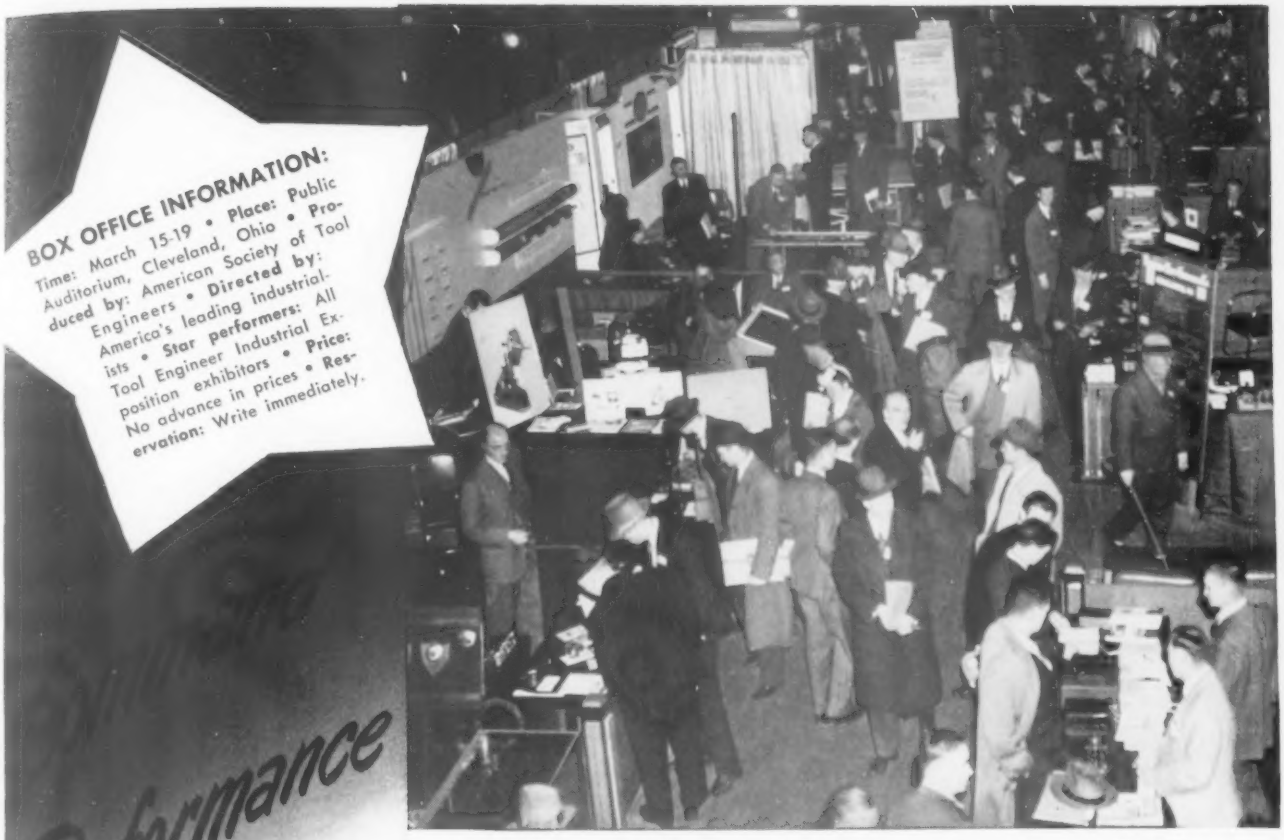
PROPER WORKING EQUIPMENT

WHILE only nature can help the little miss, Thriftmaster Multiple Spindle Drillheads are designed to accelerate your production.

Standard adjustable heads are made with 2, 3 or 4 spindles. Three- and four-spindle types, as illustrated, drill in a circular pattern. Three-spindle heads are also furnished for drilling equidistant on a straight line.

In all Thriftmaster Drillheads, power is transmitted from a fixed-center drive directly to the drill spindles by means of heavy, immersion-lubricated gears. All gears and rotating parts are of alloy-hardened, heat-treated steel for proper strength and wear characteristics and are ball bearing mounted to insure long life at maximum operating capacity. For information or recommendations write to: ENGINEERING DEPARTMENT, THRIFTMASTER PRODUCTS CORP., 1048 N. PLUM ST., LANCASTER, PA.

THRIFTMASTER
Multiple Spindle Drillheads



The "Standing Room Only" sign was out at the last Tool Engineers' Exposition. Get your reservation in early!

. . . that commands attendance!

The curtain's rising on ways and means to aid *tool engineers* and *industrial engineers* in their drive for greater production.

Just around the corner of the year the American Society of Tool Engineers will present in Cleveland, Ohio, the most spectacular Tool Engineers' Industrial Exposition ever held.

Production is on the march! The latest developments in tools, machines and industrial equipment for the world's vitally needed increased production will be presented at this Exposition. You cannot afford to miss this opportunity to participate and exhibit your contribution toward increased production efficiency to this vast and select audience of equipment buyers.

New and different products and methods, technical sessions, plant tours and industrial movies all add up to a more business-producing Tool Engineers' Industrial Exposition than ever before.

Fifth row center for a star-packed performance!

The men who dictate what shall be bought, and from whom, are the self-same men who attend the Tool Engineers' Industrial Exposition again and again.

Proof? Thousands of these "men who count" attended the last Exposition in 1946. And every one of them was connected directly with manufacturing, or was an industrial or tool engineer, hunting (and finding) better ways to do his job.

Extra Added Attraction:

Coincidental with the Exposition, ASTE members will meet for their 16th Annual Convention and technical sessions in Cleveland. It's your big chance to sell the tool engineer . . . so make it a date for '48!

. . .

For complete information write the

EXPOSITION COMMITTEE

AMERICAN SOCIETY OF TOOL ENGINEERS

1666 PENOBSCOT BLDG.

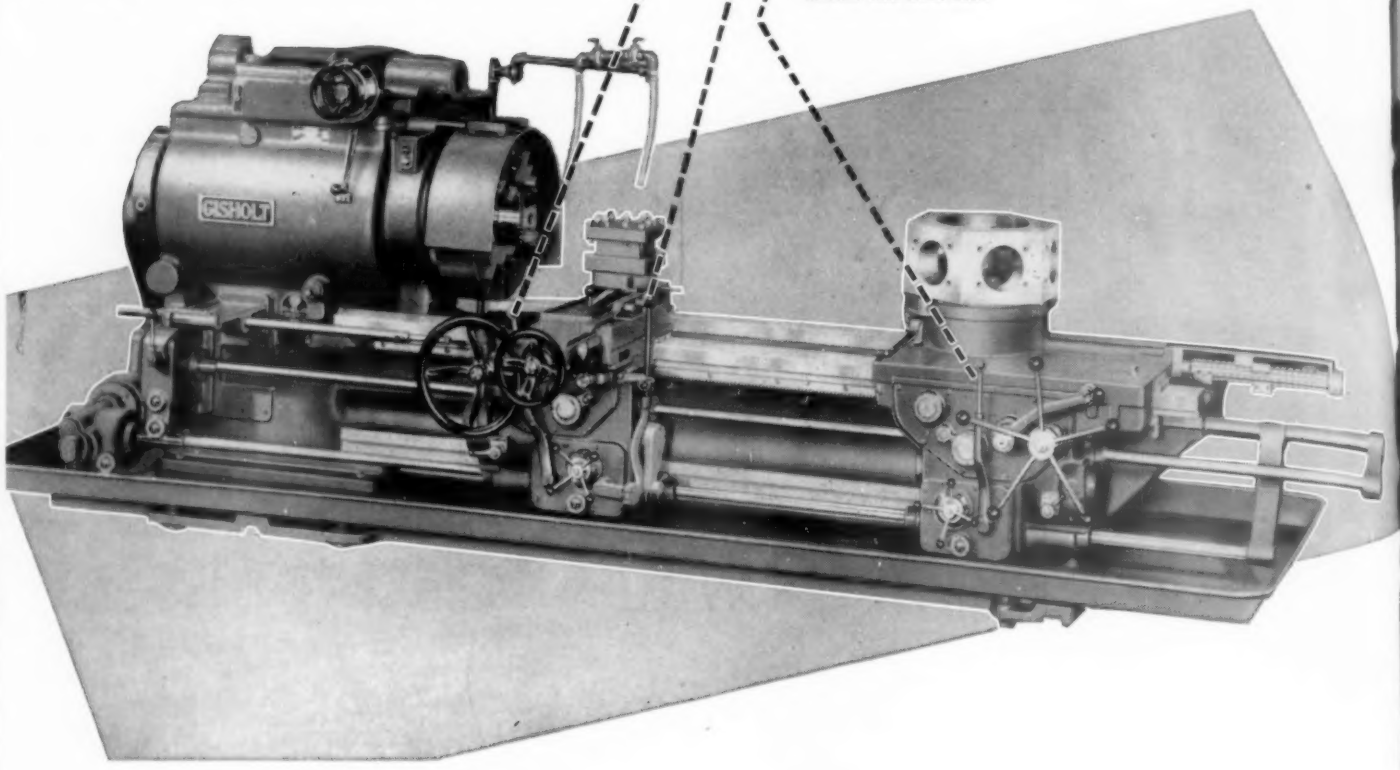
DETROIT 26, MICHIGAN

6-WAY power rapid traverse

For movement of square turret carriage back and forth along the bed

For movement of cross slide in and out

For movement of hexagon turret carriage in both directions

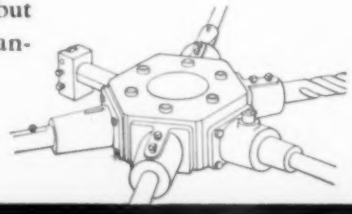


GISHOLT High Production Saddle Type Turret Lathes

Whatever the movement on approach or retraction of tools—on both square and hexagon turrets—Gisholts provide power rapid traverse that saves time and effort.

Power is transmitted from an independent motor through worm reduction to each apron, insuring smooth and easy control of heavily loaded turrets by convenient traverse levers. Feeds are automatically disengaged when traverses are used.

Power rapid traverse, as perfected for every movement of both carriages, is but one of many important Gisholt advantages that reduce time and costs on a variety of turning work. Learn about all the advanced features on Gisholt Turret Lathes. Write for literature.



GISHOLT MACHINE COMPANY

1245 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . with Gisholt

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

HIGH SPEED STEELS

In Grades the Small-Tool Industry

prefers!

You'll find a predominant number of tool makers use Vanadium-Alloys High Speed Steels because of their proved superiority in uniformity, in soundness, in composition, in grain size, in hardenability and in toughness.

There are grades to fit your every need—all made to our single standard of quality. Consult our representatives, or send for descriptive literature.

RED CUT SUPERIOR—America's best known tungsten high speed steel—for all cutting purposes.

VASCO M-2 and 6-6-2—Tungsten-Molybdenum high speed steels, for general cutting purposes.

VAN-LOM and 8-N-2—Molybdenum high speed steels, for general cutting purposes.

RED CUT COBALT—Extra Duty—heavy cuts, fast speeds, hard or abrasive materials.

GRAY CUT COBALT—Super Duty—hogging cuts, high speeds, heat treated or abrasive materials.

NEATRO—Superior Wear Resistance—delivers top performance on non-ferrous materials, cast steel, cast iron, heat treated steels.

VASCO SUPREME—Entirely New—higher hardness, higher wear resistance, higher hot hardness, higher speeds.

Manufacturers of FIRST QUALITY TOOL and DIE STEELS —*exclusively*

FIRST QUALITY TOOL STEELS

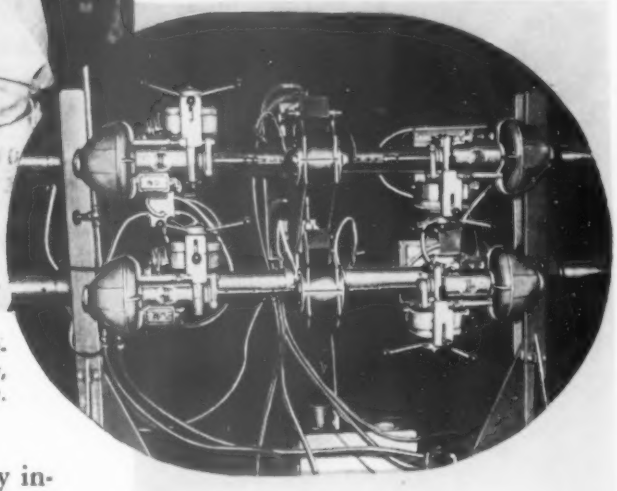
Vanadium-Alloys Steel Company

COLONIAL STEEL DIVISION
ANCHOR DRAWN STEEL CO.

Latrobe, Pa.

700% PRODUCTION INCREASE...

with STANDARD WALKER-TURNER DRILL HEADS

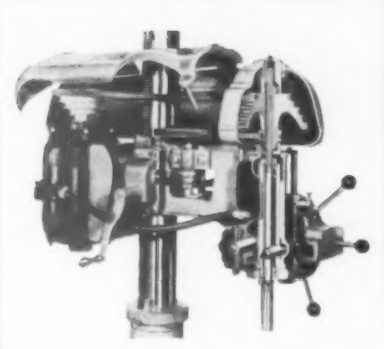


Eight separate operations are consolidated into one by using four STANDARD Walker-Turner 20" Power Feed Drill Heads, mounted horizontally, to drill both ends of two double end tube closures simultaneously.

"We have been amazed at the economies obtained by incorporating standard Walker-Turner 20" Power Feed Drill Heads in a special set-up which we designed," says Mr. A. G. Stahl of the Engineering Department of the Tube Manifold Corporation, Buffalo, N. Y.

"In drilling double end tube closures, eight operations were consolidated into one. With a single operator, production has been increased 700%.

"We prefer Walker-Turner Drill Presses because of the added advantages of the ten spline spindle with no play, the six inch spindle travel and wide speed ranges. The low initial cost of these machines and their adaptability for special set-ups have solved many of our production cost problems."



D1100X—20" Power Feed Drill Head Unit. Five standard spindle speeds, 400 to 2600 r.p.m. with 1740 r.p.m. motor. Price, less motor $216.00

TWENTY-FIFTH YEAR
1922 1947

Write for catalogue with complete specifications

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS 162

MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS • RADIAL SAWS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Contour Sawing

19 Models

Contour Sawing saves industry thousands of man-hours every day. It differs from other machine-tool processes in that it does not waste time "whittling" stock to shape but *slices* off unneeded parts – even hard alloys and tungsten carbide. Makes internal or external, curved or straight cuts at any angle. Operators trained in few days – do not need years of machinists' experience. With many special blades and infinitely variable speeds, *Contour Sawing* cuts anything and makes amazing production economies in all industries. Ask about the special DoAll customer research service, free movie for industrial groups, schools, etc.

The DoALL Company

Reg. U. S. Pat.

REPRESENTATIVES IN 56 COUNTRIES

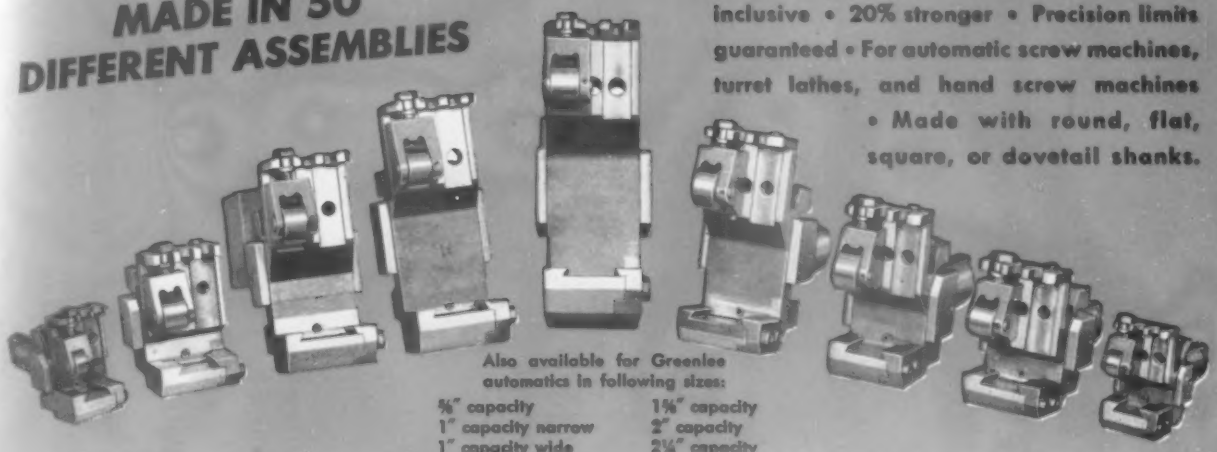
DoALL STORES IN KEY CITIES

Des Plaines, Illinois

Slitters SHAVING TOOL HOLDERS

MADE IN 50 DIFFERENT ASSEMBLIES

Loose jaw for easy tool removal and to take up variance in sizes • 13 sizes 7/16" to 5" inclusive • 20% stronger • Precision limits guaranteed • For automatic screw machines, turret lathes, and hand screw machines • Made with round, flat, square, or dovetail shanks.



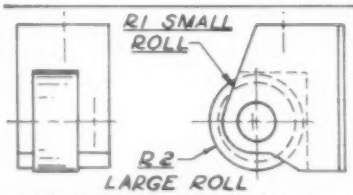
Also available for Greenlee automatics in following sizes:

5/8" capacity	1 5/8" capacity
1" capacity narrow	2" capacity
1" capacity wide	2 1/4" capacity

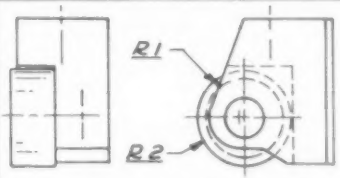
Now Available in Three Types

Adding New Roller Positions to the Shave Tool Holder

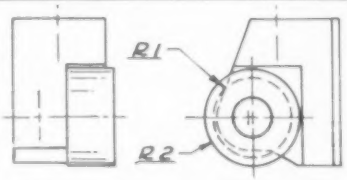
STANDARD ROLLER BACK RESTS



STRADDLE TYPE: MADE FOR ALL SHAVE TOOL HOLDERS - SIZES 7/16" TO 5" INC.



LEFT HAND OFFSET TYPE MADE FOR SHAVE TOOL HOLDERS FROM SIZE 7/16" TO 2 1/4" INC.



RIGHT HAND OFFSET TYPE MADE FOR SHAVE TOOL HOLDERS IN 3 SIZES ONLY - 7/16"; 5/8"; & 1".

FOR RESTRICTED CENTER DISTANCES

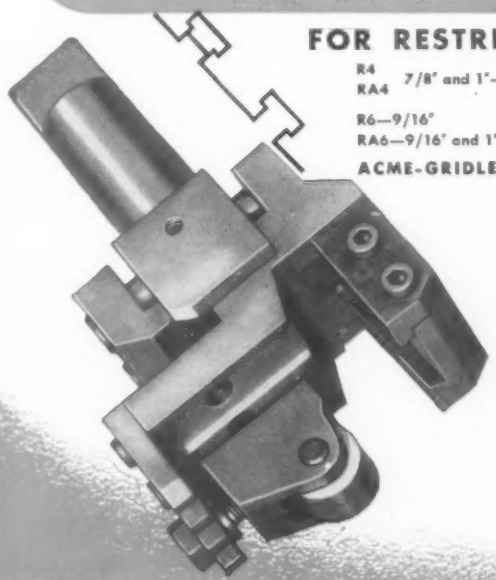
R4 RA4 7/8" and 1"—2nd Pos.

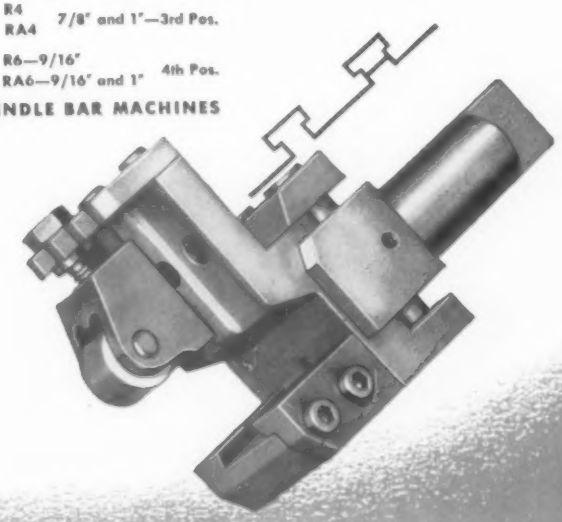
R4 RA4 7/8" and 1"—3rd Pos.

R6—9/16" RA6—9/16" and 1" 3rd Pos.

R6—9/16" RA6—9/16" and 1" 4th Pos.

ACME-GRIDLEY MULTIPLE SPINDLE BAR MACHINES





SCREW MACHINE TOOL COMPANY

17565 SWIFT AVENUE • DETROIT 3, MICHIGAN

MANUFACTURERS OF ACCESSORY TOOLS FOR ALL TYPES OF AUTOMATIC SCREW MACHINES

VICKERS Variable Speed HYDRAULIC TRANSMISSION

1/2 Horsepower

(PATENTED)

PRICE

$75.00

Here is a compact, sturdy, variable speed hydraulic transmission for machinery drive. Any speed from zero to 1750 rpm—*in either direction* can be obtained without reversing the driving motor.

Effortless finger tip speed adjustment over the entire range is obtained by the handwheel control and the selected speed remains constant. A hydraulic servo control mechanism is also available. The full output torque is available throughout the speed range and the built-in automatic overload protection permits stalling without causing damage.

The Vickers hydraulic transmission is automatically pressure lubricated by the power transmitting medium (oil) for long and trouble-free operation.

Contact the Vickers Sales Engineering and Service Office nearest you for complete information.

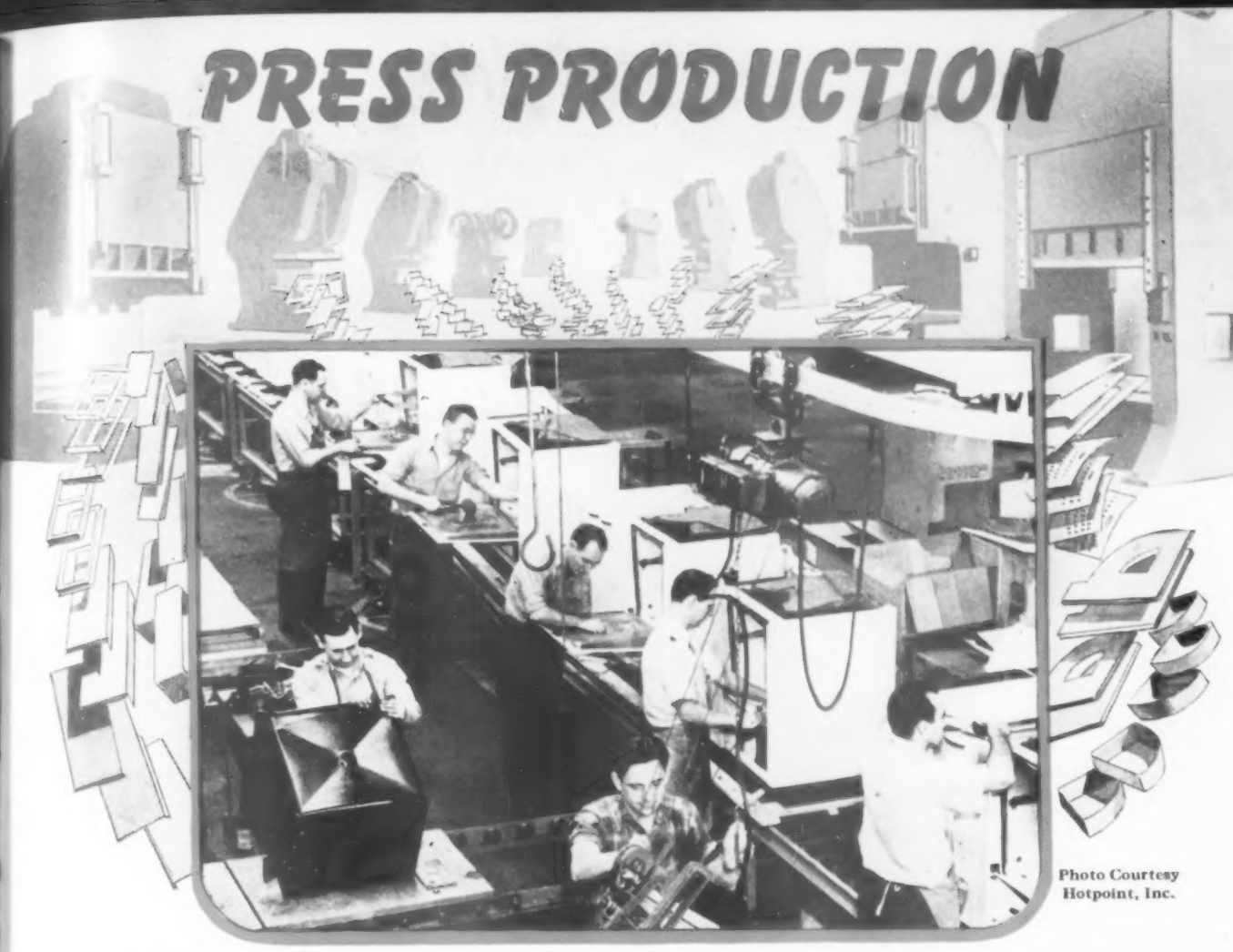
ASK FOR BULLETIN No. 47-40

VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1416 OAKMAN BOULEVARD • DETROIT 32, MICHIGAN

Sales Engineering and Service Offices: ATLANTA CHICAGO • CINCINNATI • CLEVELAND • DETROIT LOS ANGELES • NEWARK • PHILADELPHIA • ROCKFORD • ROCHESTER • SEATTLE • ST. LOUIS TULSA • WASHINGTON • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

PRESS PRODUCTION



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Hotpoint, Inc.

FEEDS THE ASSEMBLY LINE

The Assembly Line—symbol of American Mass Production—depends on a rapid and constant flow of finished parts to each stage of the assembly.

Largely responsible for keeping the line moving, Presses provide the fast, all-around production of duplicated metal parts that modern standards of production demand.

Danly Die Sets—a *necessary part of good Presswork everywhere*—speed die making programs, protect costly dies, cut down time for regrinds. Danly Die Sets and Die Makers' Supplies are nationally recognized for *known dependable accuracy.*

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois

DANLY *National Assembly*

Call Danly

- **MILWAUKEE 2** — *111 East Wisconsin*
- **DETROIT 16** — *1549 Temple Avenue*
- **CLEVELAND 14** — *1550 East 33rd Street*
- **DAYTON 2** — *990 East Monument*
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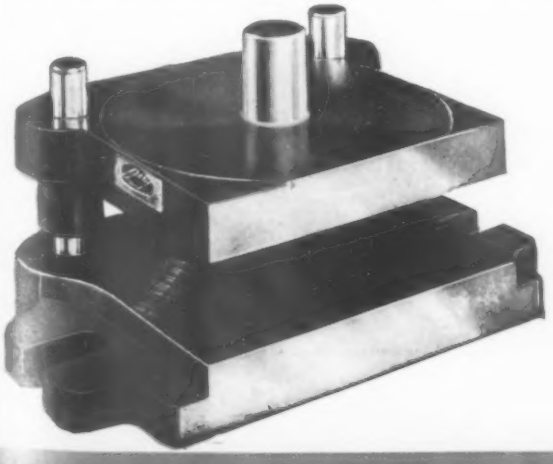
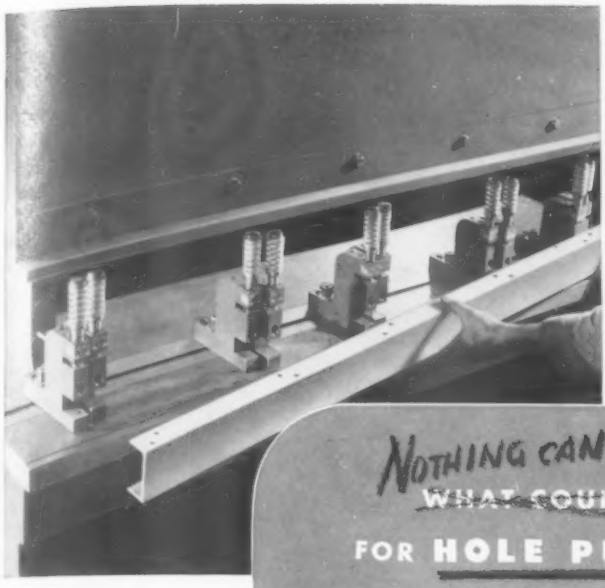
- **PHILADELPHIA 44** — *18 W. Chelten Avenue*
- **LONG ISLAND CITY 1** — *47-28 37th Street*
- **DUCOMMUN METALS & SUPPLY CO.** — *4890 South Alameda, Los Angeles*



DIE MAKERS' SUPPLIES

DANLY DIE SETS

Welded Steel Fabrication



Illustrating a staggered setup of Type "EJ" Units on a "Strip" Template with the work punched in foreground.

Showing a straight line setup with work in position on top of dies ready to be punched with down stroke of ram.

NOTHING CAN BE ~~WHAT COULD BE~~ SIMPLER

FOR **HOLE PUNCHING** THAN

THE WALES

PATENTED AND EXCLUSIVE TEMPLATE MOUNTING METHOD*

in combination with **WALES TYPE "EJ" UNITS**
for punching angles, channels and extruded sections

● One of metal fabricators most difficult hole punching problems . . . punching a series of holes simultaneously in extruded shapes . . . has been ELIMINATED by independent, self-contained Wales Type "EJ" Hole Punching Units.

Wales Patent Mounting Method requires only one template which is a combined base plate and template. This permits the templates not in active use to be stored for future runs. And the group of units which has been removed is kept in continuous operation on other templates.

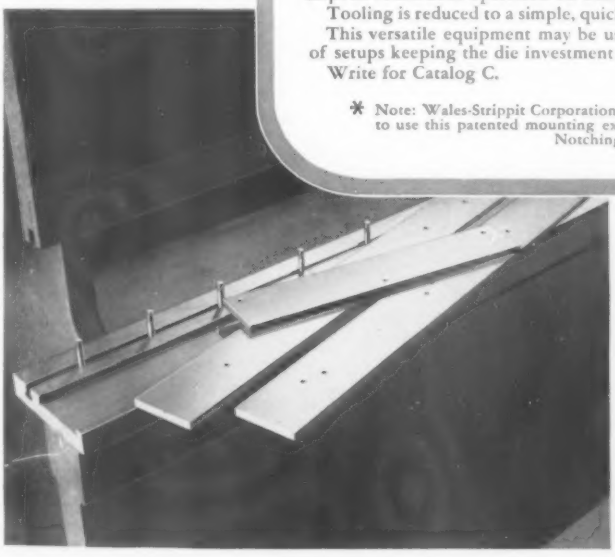
Tooling is reduced to a simple, quick assembly operation by *all* Wales Units.

This versatile equipment may be used and reused in an unlimited number of setups keeping the die investment in continuous productive operation.

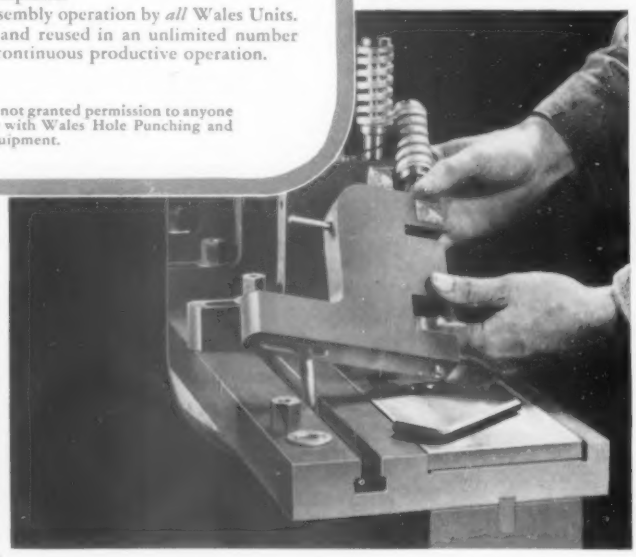
Write for Catalog C.

* Note: Wales-Strippit Corporation has not granted permission to anyone to use this patented mounting except with Wales Hole Punching and Notching Equipment.

Showing three "Strip" Templates each with a different pattern for setting up Units. These three "Strip" Templates are interchangeable in the press bed rail.



Illustrating how a Type "EJ" Unit is set up by setting units simultaneously over bolts in T-slot and pilot pins into holes in "Strip" Template. Then lock units to T-slot with nut, bolt and washer sets.



WALES-STRIPPIT CORPORATION

GEORGE F. WALES, President

393 PAYNE AVENUE, NORTH TONAWANDA, N. Y.
(BETWEEN BUFFALO AND NIAGARA FALLS)

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

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SOCKET CAP SCREW

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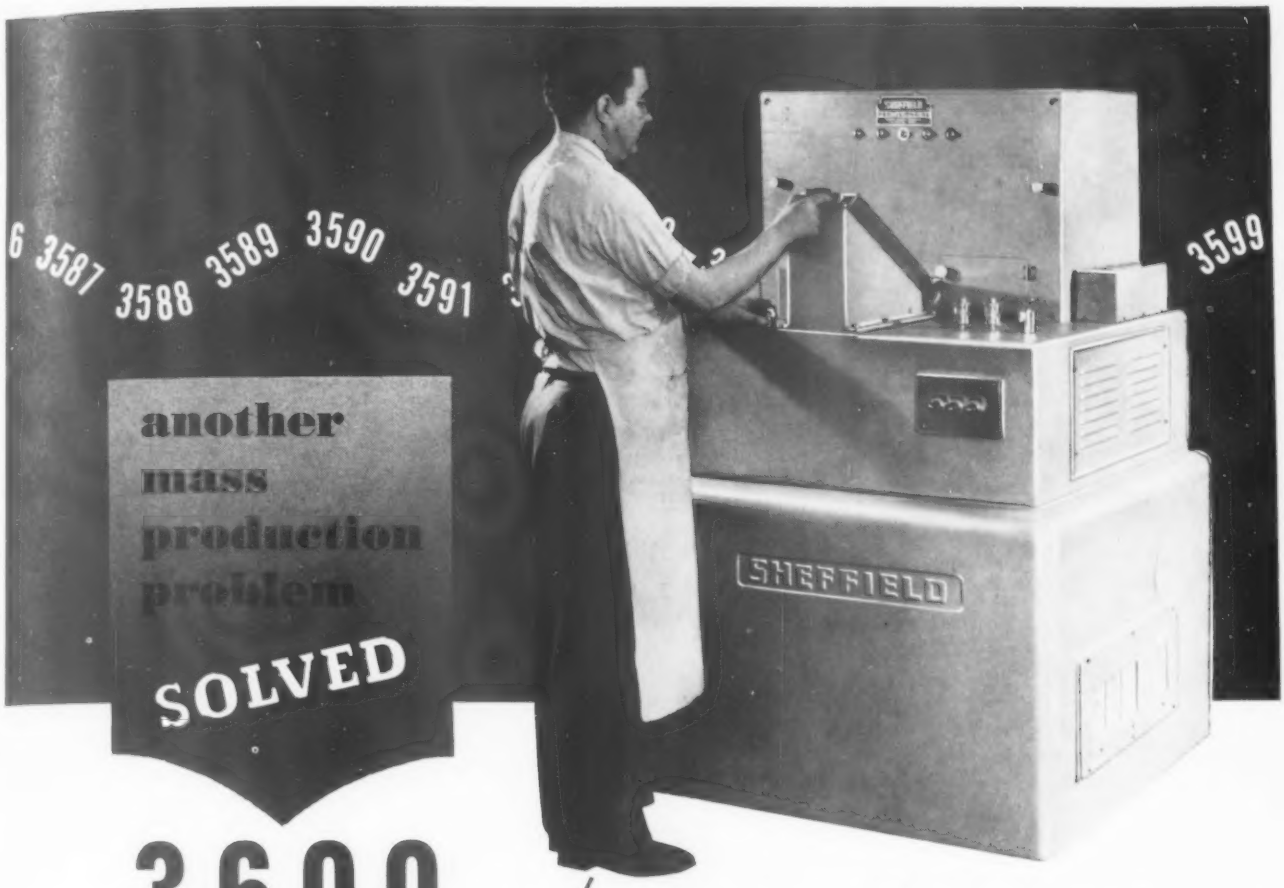

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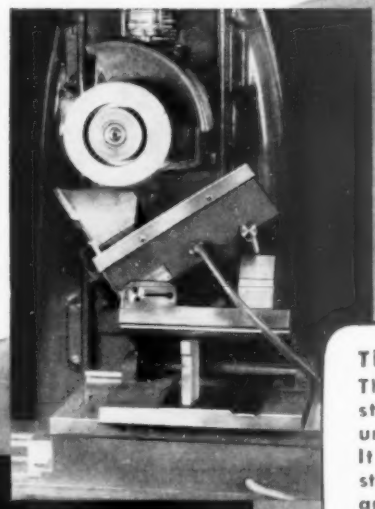

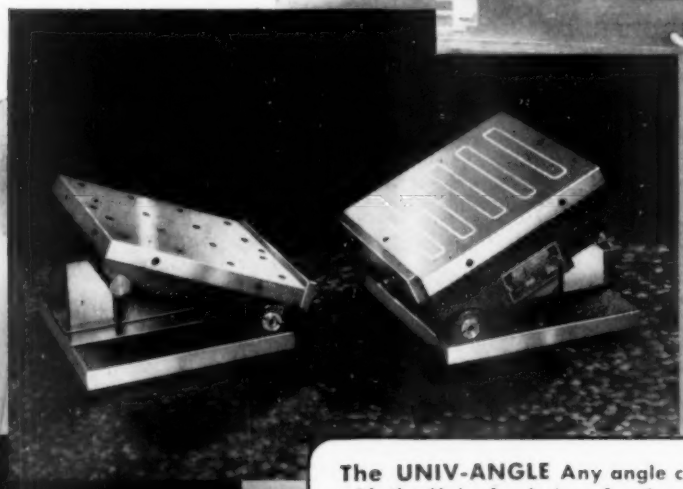

The MAGNA-SINE The Magna-Sine is a sturdy, precision-built unit for angular set-ups. It is available in two styles—one for single angles only and the other for both single and compound angles. Each style is made in two sizes.

The work is held by magnetic attraction eliminating distortion or movement of the work piece. The Magna-Sine can be clamped directly to the machine table and is adapted to parallel or angular work in a matter of seconds.

The UNIV-ANGLE Any angle can be accurately set up with the Univ-Angle in a fraction of the time required by other methods.

The Univ-Angle is made up of two hinged units ground and lapped to precision limits on all sides. One of these units has a magnetic top plate; the other tapped holes. To set-up compound angles, one unit is placed on the other and the angles are determined by the use of standard gage blocks. There are no dials or scales. Angles may be switched from right to left hand by turning the top unit 180 degrees on the bottom unit.

The ROBBINS SINE PLATE Made on the same principle and with the same sturdy precision as the Magna-Sine, but is non-magnetic. Extremely useful for inspection departments or for operations where electric current is not available.

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